METAL INDUSTRY
VOL. 36, NO. 5 FABRICATION · ASSEMBLING · PLATING · FINISHING MAY, 1938

Editorial

American Metals—Peace-Time Materials

European armament plants are straining to the limit of their capacity; foreign metals are going into munitions at an unprecedented rate; our own Government is committed to a Naval expansion program. The impression is abroad therefore, that the American metal industries are deeply involved in munitions. A judicious statement by Robert C. Stanley, president of the International Nickel Company, made at the annual meeting of his company throws light on this question, all too often clouded with irrelevancies and mis-statements. Mr. Stanley's remarks covered only Canadian nickel, but many of his conclusions can well be carried over to other metals. He stated authoritatively that:

1. Canadian nickel is neither essential to war nor is it essentially a war material. War usage of nickel is a small portion of the total consumption.

2. A partial embargo on Canadian nickel would be ineffectual in preventing war. A complete embargo would stimulate the production of nickel from other known deposits.

Granted that other materials are not in exactly the same position. Granted that steel, copper, zinc and lead are used in substantial quantities in the manufacture of munitions. Nevertheless, in the United States, the percentage of metals going into war channels is a very small part of the total output. By the same token as for nickel, embargoes on any or all metals would be ineffective. Embargoes would only stimulate outside sources to produce more heavily.

It is safe to say that the overwhelming majority of American manufacturing interests would heartily approve a practical plan for elimination of war and the stoppage of armament races. Like Mr. Stanley they would welcome a situation in which no part of their product would be utilized for war purposes. American metal products are essentially, and almost entirely, a peace-time industry.

Porosity and Plating

Electroplated coatings have long suffered from the general judgment of industry that they are porous. To be sure the word "porous" needs definition. We know that hot dipped coatings are also porous. Even forged and rolled metals are "porous" by certain standards. (It is not difficult to force hydrogen through steel, for example). Porosity is still clouded by vagueness of definition.

Of striking interest, however, is a paper read at the last meeting of the Electrochemical Society (see page 236 of this issue) by Hothersall and Hammond on "The Causes of Porosity in Electroplated Coatings, Especially of Nickel on Steel." These investigators found that finely divided solid matter in suspension in the solution, foreign matter in the surface of the steel and a rough condition of the surface were the most important causes of porosity in nickel deposits formed on unpolished steel. They found also that by eliminating suspended matter from the solution and by using specially prepared electrolytic iron or finely machined mild steel rod as the basis metal, pore-free nickel deposits (by the hot-water test) less than 0.0001″ in thickness were produced.

To be sure the methods involved the finest and most careful laboratory technique, extremely difficult to follow commercially. Nevertheless when we consider the great technical advances in other metallurgical processes, and for instance, the high purities obtained in the refining of copper and nickel, only by the use of electrodeposition, it does not seem at all impossible that nickel can be deposited practically without pores.

The admirable corrosion resisting properties of nickel would, of course, be much more effective in a coating free from pores. The possibility of depositing nickel without pores, therefore, opens new territories to the electroplating industry if the methods can be made practical.

This paper points an interesting road to improved practice.

Last Convention Call

This is almost our last opportunity to remind our readers that the annual Convention of the American Electro-Platers' Society will be held in Milwaukee, Wisc., June 13-16.

From all indications the Society will continue its practice of holding bigger and better conventions every year. The educational program is rounding out rapidly and 20 of the 29 branches have agreed to present exhibits of plated work. There is still time for the other 9!

The June issue of METAL INDUSTRY will carry in full, the advance information about the program, technical and recreational. Milwaukee is one of the best convention cities in the West. It is hoped that this gathering will put the recession to shame!

Development and Use of Anaconda Electro-Sheet Copper

Electro-deposition used as a direct process of manufacture. Ingenious methods of producing smooth, continuous thin sheet.

By **A. L. O'BRIEN**
Service Engineer, The American Brass Company, Waterbury, Conn.

THIN sheet copper in wide widths and long lengths is being made electrolytically on a commercial scale at the Raritan Copper Works, Perth Amboy, N. J. This achievement is the result of six years of intensive development preceded by almost thirteen years of intermittent research.

Patented Methods

While the idea of producing sheet copper by the electrolytic process is old, the literature on the subject is limited. It is evident, however, that the idea has been attractive to many investigators for years, if the issued patents in the field may be taken as an indication. These patents may be divided into three groups. In one group metal is deposited on some form of endless cathode, of which a revolving cylinder or drum is the most common. The cathode moves slowly and at such a rate that metal of the desired thickness is deposited during one pass through the electrolyte. The deposited metal is stripped off the cathode at a point above the solution level and, after washing and drying, is wound up immediately. In the next group of patents a band of thin metal is increased in thickness by being guided through an electrolytic tank in opposition to suitable anodes. The third group covers means of producing sheets of definite dimensions where flat plates or revolving cylinders are used as cathodes. With such cathodes, sheets of definite dimensions are built up to the desired thickness and then stripped off.

Anaconda Process

The process as worked out at the Raritan Copper Works is of the first group. Here a sheet weighing up to 7 oz. to the square foot is produced on a revolving cylinder.

As shown in Fig. 1, a lead-covered copper drum is mounted horizontally on a lead-lined concrete tank so that it is partly immersed in the electrolyte. The cylindrical surface of the drum immersed in the electrolyte is opposed by lead anodes spaced about ½ in. from it. The electrolyte, made up of appropriate quantities of copper and sulphuric acid, flows into and out of the tank continuously. The ebullition of gas at the surface of the anodes induces a vigorous circulation of electrolyte between the anodes and the drum surface, which is augmented by means of compressed air introduced through a pipe between the ends of the anodes under the center of the drum, not indicated on the diagram. This vigorous circulation is necessary in order that copper may be deposited at a comparatively high rate. The deposited sheet is continuously removed from the surface of the drum after one pass through the electrolyte. Means for washing the plated surface of the drum as it emerges from the electrolyte, before stripping, is provided. The heat of the drum assures com-

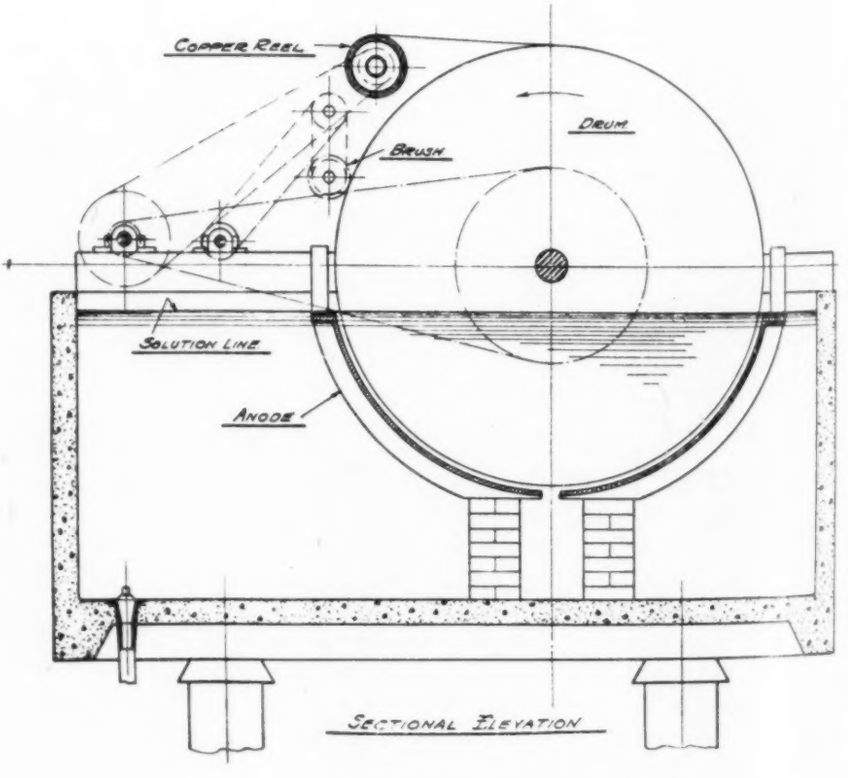


Fig. 1. Sectional elevation of drum equipment

plete drying before winding. The surface of the sheet next to the drum has a bright satin finish, while the other side has the characteristic appearance of deposited copper. The roll is ready to be trimmed and shipped without further treatment.

The process is peculiarly adapted to operation in a copper refinery. The use of lead anodes in the drum section reduces the number of liberator tanks necessary in the regular refinery operation. The tanks in each section are connected to the regular electrolyte system of the refinery. The electrolyte flows directly and continuously from the tank house through the drum section and back. Needless to say, careful control of acid and copper content of electrolyte, as well as temperature and rate of circulation, is necessary in both sections.

The sheet material produced is sound and uniform, both in physical properties and gauge. The control of average thickness is fairly positive, depending simply upon speed and current flow, while localized variation is slight and well within the limits of commercial variation. The remarkable smoothness and uniformity of the product is due primarily to the fact that plating is confined to one side of the sheet and that it never passes beneath an anode. Physical tests indicate a slight grain effect lengthwise of the sheet; that is, tensile strength and elongation are greater lengthwise of the sheet than crosswise.

Problems in Development

The problems encountered in the development of the process have been numerous as well as difficult. First and most important is the surface of the drums. It is probable that lack of a suitable starting surface has been the most serious single obstacle in the earlier development of a process for the electrolytic production of thin metal sheets. Heavier sheets have been produced in this manner for various purposes in different places for some time, but this production has been limited, as there is no advantage in producing heavy sheets in this way except under peculiar circumstances. While the surface of the drum is relatively unimportant with this class of work, it is most important when an attempt is made to produce wide sheets in the foil class for any length of time. Almost any suitable metal surface properly polished may be used successfully for a few hours or even a few days, but continuous operation month after month, and even for several years, is quite a different matter. The surface is subjected to extreme corrosive conditions as it enters the bath and the mechanical effect of stripping is considerable. After trying many different metal surfaces, including copper, silver, chromium, stainless steels, and even tantalum, to mention only a few, lead was finally decided upon as the most promising. Lead alone, however, may not be used successfully for more than a few days. This time may be prolonged by the use of suitable well-known stripping agents, but it was realized eventually that the solution of the problem of uninterrupted continuous production for a long period did not lie in this direction. Finally a mechanical means of continuously treating the surface of the drum was developed. This is a grinding and polishing operation, carefully controlled. In this manner a new metallic surface is presented to the action of the electrolyte for each revolution of the drum. The lead surface of the drum is one inch thick and may be used continuously for about two years before renewal is necessary.

Of almost equal importance is the treatment of the edges of the drum. Unless means to prevent are provided, the edges of a sheet produced in this manner are thick and ragged. This again is negligible when heavy metal is produced, but suitable treatment of the edges of the drum is vital when it comes to the production of very thin sheets. The use of stop-off media, such as varnish or asphaltum, to define the plated area, as well as the use of "thieves" attached to the cathode to control thickness, is old in the art of electroplating. Similar means have been tried in the electrolytic production of sheet metal in the past. All these were tried during the development of the present process, with more or less success for a comparatively short time, but none was found to be suitable for long-continued operation. Finally a combination of mechanical and electrical means for accomplishing the desired result was developed. Increased thickness at the edges of the sheet is prevented by means of shields that obstruct the flow of current from the edges and back of the anodes. A clean-cut edge, which may be stripped without tearing, is produced by secondary cathodes suspended on the tank walls, so connected that they are cathodic to the ends of the drum. The solution at the ends of the drums is separated from the main body of

Fig. 2. Stripping the copper sheet from the plating surface

electrolyte by means of the shields referred to. Therefore, the surface of the ends of the drum is always anodic to the electrolyte in contact with it, and no plating on it is possible, while the cylindrical surface of the drum, upon which the sheet is deposited, is cathodic to the main body of electrolyte. In this manner plating over the edges of the drum is prevented and clean-cut edges are produced on the sheet.

A new electro-sheet copper plant has been built and is now operating. This plant will contain seven drums 85 inches in diameter by 64 inches wide; one drum 66.5 inches in diameter by 51 inches wide, and five drums 66.5 inches in diameter by 31 inches wide. This means a greatly increased capacity to meet the growing demand for electro-sheet copper in thin gauges of wide widths.

Uses for Electro-Sheet Copper

The trend today, in large building construction as well as small house construction, is toward air conditioning and insulation. Many insulating materials being marketed must be protected against moisture to retain the insulating efficiency. The presence of only a small percentage of moisture lowers the efficiency of such insulation so much that it is practically useless. Electro-sheet copper can be used to good advantage to protect such insulating materials as well as offering excellent protection against air-infiltration and vermin attack.

Many thousands of squares of two ounce electro-sheet have been installed in built-up roofs and on spray pond decks where the service is very severe. In built-up roof construction two methods can be employed. One method calls for two plies of two ounce electro-sheet copper with hot asphalt moppings below, between and above the plies of copper. The other method calls for one ply of copper sandwiched between plies of felt, the top ply of felt being asphalt-saturated asbestos felt.

Electro-sheet copper in weights from ounce up to seven ounce in widths of 30″ up to 60″ have been combined with heavy kraft paper, burlap, felt, steel and felt and coated on both sides with asphalt for spandrel flashings, shower-stall pans, and general waterproofing. The paper-backed copper has been used also for window and for door flashings very extensively.

For lining concrete burial vaults electro-sheet copper has found wide consideration. It not only waterproofs the vault but presents an artistic appearance. In a similar manner the lining of cases for export shipment of damageable goods is of importance. The cases are made watertight and proof against vermin attack.

Electro-sheet in the two ounce weight has excellent merit in protecting oak flooring, rubber flooring, linoleum or any other flooring material where they are laid over concrete at below-grade levels. This has always presented a perplexing problem which was never fully solved. There are numerous instances where this copper sheet has been laid between the concrete and the flooring material. All reports indicate satisfactory results have been achieved.

One ounce electro-sheet copper backed with gummed paper has been made up for gummed labels for bottles and packages. Printing and coloring on the copper make a very attractive label. Christmas and other holiday greeting cards have been made by the millions in the past few years.

Industrial Uses of Silver*

Reports from the Research Fellows submitted to the sponsors of the American Silver Producers' Research Project describe the status of their work in investigating new uses for silver in industry.

Electrodeposition of Silver and Silver Alloys

A procedure has been worked out for the production of thick (0.01 to 0.05 in.) adherent deposits of silver on steel. In addition to a direct deposition method, details have been worked out for a process utilizing an intermediate electroplate of a third metal, particularly copper. The relationship between thickness of deposits and imperviousness of the electroplate is being studied.

Nickel, cobalt, cadmium, copper, iron, zinc and lead have been co-deposited with silver from aqueous solutions, resulting in deposits possessing interesting properties.

Since silver deposits were found to be readily stripped from aluminum cathodes, the latter might serve as starting sheets for the production of films and sheets of silver.

An extensive and annotated bibliography on silver plating has been compiled.

Silver in Manufactured Products

As a part of the study of the electrical properties of silver, the characteristics of sliding silver contacts and silver graphite brush materials are being studied. New opportunities appear to exist for improved design for electrical equipment.

Interesting indications have been obtained from studies of silver alloyed with other metals for aviation engine bearings. In the metallurgical studies, silver has been found an effective alloy hardener of the solution forming type. In addition interesting aging properties are developed in certain alloys.

Through cooperation with an industrial manufacturer of cans, a relatively inexpensive form of solderless silver-lined container has been developed, suitable for shipment and storage of pharmaceuticals, chemicals and possibly foodstuffs. Twelve-ounce containers have been produced from silver-clad copper and steel sheets, 0.012 in. thick, with the silver cladding 0.001 in. in thickness, and the development of larger sizes is now in progress.

Information on any details of the Silver Research Project can be obtained by writing to A. J. Dornblatt, Senior Research Associate at the National Bureau of Standards, Washington, D. C.

*From the Technical News Bulletin of the National Bureau of Standards, April, 1938.

Modern Plating and Finishing of Jewelry and Novelties

A completely new plant installed by Cohan-Epner Co. Inc., of New York City. Modern equipment, plus straight-line layout keeps production costs at a minimum.

EMANUEL COHAN and Louis Epner have been co-workers for thirty-six years both starting as apprentices in 1902 with the concern of Joseph Landsman of New York, well known to the old timers in the industry as an expert gilder and colorer (so-called in those days), a teacher who mastered his trade in the shops of Tiffany and Mauser Mfg. Co. After nine years of practical experience, Mr. Cohan and Mr. Epner formed a partnership in 1911 under the trade name of Cohan and Epner. In 1913 the company was incorporated as Cohan-Epner Co. Inc. of New York.

Their first shop was located for nine years at 51 Maiden Lane, where they specialized in finishing metal on contract, on a production basis, for manufacturers of jewelry, novelties and allied industries. In 1920 the company moved to larger quarters at 122 Center Street, New York, where they carried on a growing business for the past eighteen years. Recently they were compelled to move to still larger quarters, at their new address, 142 West 14th Street, New York.

Variety of Products and Finishes

The type of work which this firm does requires an extraordinary variety of facilities to provide the diversity of finishes demanded by the consumer of novelty and jewelry products, such as costume jewelry, metal novelties of all kinds and a thousand and one other items.

In addition to the large staple line of metal products which they are required to plate, this company has been a pioneer in the development of an important specialty, the metallizing of non-metallic objects, such as wood, cork, plastics, Catalin, Bakelite, celluloid, plaster of Paris, stone, glass, leather, various compositions, etc.; even vegetables and animal matter. After being metallized the items so treated can be soldered and finished in either modern or antique gold or silver finishes, and used as costume jewelry and other novelties.

Plant and Equipment

The new plant has been laid out by experienced engineers, familiar with problems of the plating inudstry, and has also incorporated many new ideas gained through years of practical experience, by E. Cohan, L. Epner and Mac Weiss the foreman in charge of plating with over twenty-five years to his credit in this shop. Kept in mind also was the very important factor in any plating shop, the routing of the work as nearly as possible in one continuous unbroken cycle. From the receiving department the work is moved progressively through the various operations: (1) pickling, (2) acid dipping, (3) polishing, (4) racking, (5) plating, (6) lacquering, and then through the inspection and examining department where all work is checked for perfection in finish and color by the most rigid standards; then back again to the shipping department. The large number of operations involved in plating and finishing work of this character described above make this problem extremely difficult. Unless great care is taken, it is found that the work "back tracks" and must be handled back and forth along the same line with the inevitable loss of time, labor and added expense. These losses have been practically eliminated in this installation.

The important general departments in a plant of this character are (1) Polishing, (2) Electro Plating and (3) Lacquering. Each operates more or less as a complete and independent unit, supervised by a foreman in charge of each division.

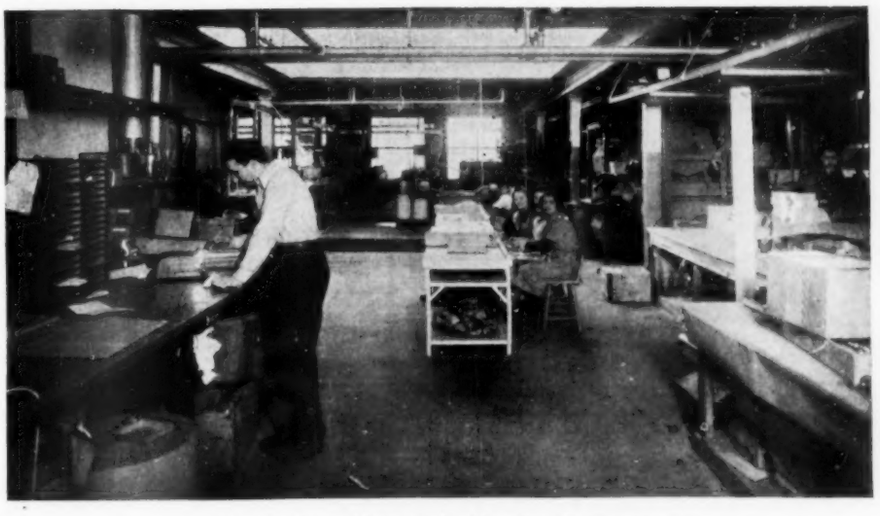


Fig. 1. Receiving and shipping department

Fig. 2. Polishing and buffing department

Polishing Department

The first is the polishing and buffing department. Equipment consists of three parallel rows of the latest type Gardner polishing lathes. Each machine is independently powered by a 5 H. P. ventilated fan type V belt drive motor with automatic push button control for starting and shut off and connected to a powerful main exhaust system.

Cleanliness, economy and safety for the operator are very important factors in the determination of the final cost of the finished product—especially with the high compensation rates based upon the silicosis law. This type of installation eliminates the usual dust collecting overhead shaft drive, with its many pulleys and dangerous belts, and as a result does help to reduce accidents and power costs besides increasing production, and delivery to the customer of finished articles of superior merit.

This department is compactly located in one section of the plant occupying about one quarter of the total space and is adjacent to the facilities of the receiving and shipping room. The illustration shows the arrangement of entire polishing room. Note the excellent light from large overhead skylights.

Plating Department

The Cleaning Department contains the usual alkaline chemical and electric cleaners, in addition to a Detrex degreaser for removing heavy buffing and other greases before placing work in the regular cleaners. This unit is located at the extreme end of the plating room floor parallel to wall and windows and includes a complete unit for bright or matt acid dip, pickle, burn off strip, etc. Over all tanks throughout the entire department is built an exhaust system eliminating all fumes and vapors.

Plating Room. Although most of the work is finished in gold on novelties and jewelry, this work demands such a variety of decorative effects that almost every plating solution will be found in this plant. Many tanks of gold solutions in all karats and popular shades of yellow, green, pink, etc. occupy the central part of the plating room floor.

Large tanks averaging in size over 6 feet, containing copper solutions, cyanide and acid, nickel solutions include bright and die cast, silver, brass, bronze, cadmium and chromium. (The gases from the chrome solution are removed by special exhaust system of its own.) In addition there are a number of tanks of various sizes for special work including black nickel, rhodium, Spekwite, and a Daniels nickel plating barrel.

Two acid copper tanks containing 1,000 gallons of solution are used exclusively for metallizing work on non-metallic surfaces. Deposits from .0005″ up to .020″ are a regular procedure in this department. The entire area of plating room floor is especially constructed of acid resisting and water proof mastic floor, complete with acid proof lead drains. This type of floor is much superior to the old concrete construction.

An outstanding feature of the plating room equipment is the installation of a complete unit, voltmeter, ammeter and rheostat on each tank giving complete control in each instance. Two large generators, one Bogue and one Chandeysson supply the necessary amperage to thirty-eight plating tanks of various solutions.

All hot solutions are heated by live steam from an oil burning boiler.

The efficiency of a plating room in producing results is based upon layout of the tanks and rinses. All tanks are set parallel to one another in units of four, with rinse water and cleaners at the end of each unit. Units

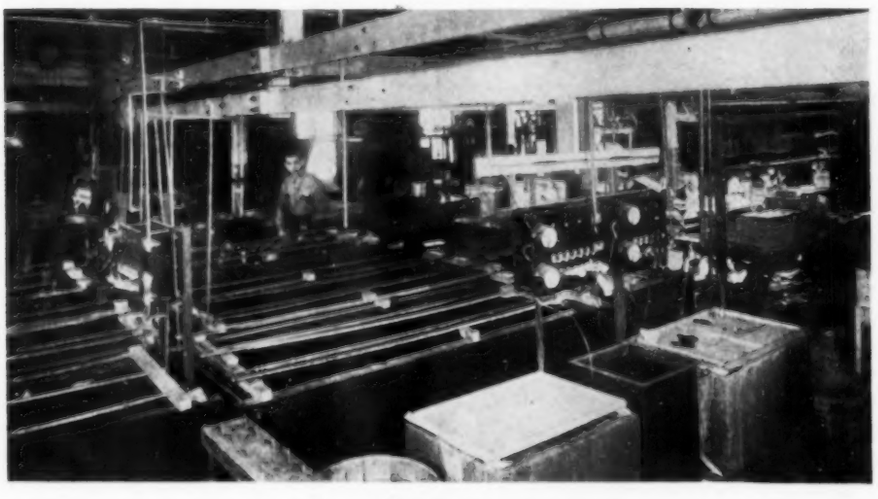


Fig. 3. Plating department

are divided into series of gold, brass, bronze, nickel, copper, chrome departments, etc., thereby eliminating interference when loading and emptying tanks.

Racks. The secret of economical, quality production plating and polishing depends to a very considerable extent on the plating racks and polishing jigs or holders built especially for the peculiar requirements of each job. In order to keep up with this work two men are continuously engaged on the premises in making all special racks and jigs necessary.

The Tumbling Department is an extremely interesting installation. It consists of a battery of seventeen wet and dry tumblers of Baird and Lupomatic make. The wet tumbling machines are on the plating floor adjacent to the acid dipping department. Dry tumbling units are on the wood floor.

What might probably be called the heart of the plant is a modern laboratory supervised by a graduate chemical engineer. A very highly organized system of chemical control over all branches of the work permits the maintenance of rigid specifications, quality and standards. Among the items of unusual equipment with which this laboratory is supplied is a fine chemical balance used to standardize reagents and weigh deposits of gold and other precious metals for specification work.

All lacquers, enamels and other finishes are put through a series of stringent tests to determine the best methods of application to assure a lasting quality of finish and wear.

EMANUEL COHAN,
President

Lacquering Department

The lacquer room, one of the key departments in this plant has been specially constructed and built according to the rules and regulations of the Building, Fire, Underwriters and other interested governmental departments and other bodies. These consist of two units, completely separated from the rest of the plant by special fireproof walls, ceiling, floor and approved type fireproof doors.

Fig. 4. Laboratory and control room

The spray room equipment consists of three spray booths, steam heated drying oven, and centrifugal machines. All control switches are explosion proof. Exhaust system and motor are installed on roof in a separate housing, thereby eliminating all possible fire risks and affording the greatest degree of safety and protection to all employees.

Outside of the lacquer room is installed a Gehnrich gas-fired baking oven for high temperature baked enamel finishes.

Of equal importance to the safety of the plant is a special lacquer storage vault. The construction of this room is unusual as the weight does not rest on floor beams like the balance of the plant, but is suspended from overhanging steel cross girders and in case of fire or collapse of floor, this room remains intact suspended from the supporting beams. The walls of this room are of eight-inch fire proof tile and completely bulkheaded from the spray room and the rest of the plant.

Receiving and Shipping Room as shown in the illustration, have complete and ample table room for examining and packing work. It is equipped with three weighing and computing scales for counting and checking small parts.

Personnel

The Cohan-Epner Co. Inc. has four key men. *Emanuel Cohan*, President, is in complete charge of production. He is a member of the American Electro-Platers' Society and a regular attendant at its conventions. *Louis Epner*, Secretary and Treasurer, in full charge of sales, credits and advertising. *Gerald L. Epner* son of *Louis Epner*, is a graduate of Polytechnic Institute of Brooklyn, N. Y. with a degree in Chemical Engineering. In cooperation with *Mac Weiss* he is in charge of all laboratory and experimental work throughout the plant. *Mac Weiss*, a member of the firm, is in charge of all electroplating departments. He has been connected with the company for twenty-five years, starting as a boy and working under Mr. Cohan's instructions from the very beginning, and also supplementing his knowledge and practical experience, with courses in electroplating chemistry under *Dr. L. C. Pan*. He is also a member of the American Electro-Platers' Society.

In conclusion, the successful operation of a contract electroplating plant is based directly on the conditions in the plant.

1—*Health*. By maintaining proper standards and hygienic conditions such as good lighting and ventilation and up-to-date exhaust systems on the polishing line and plating floor, thereby reducing compensation insurance rates.

LOUIS EPNER,
Secretary-Treasurer

MAC WEISS
In charge of all electroplating

GERALD EPNER
Laboratory and experimental work

2—*Safety.* Installing all necessary equipment and observing all the rules and regulations of the Fire and Labor Departments, thereby reducing your fire insurance rates to minimum figures.

3—*Operations or Labor.* Polishing room with independent motor drive, plus separate lines of small and large capacity, thereby reducing power costs. Equipment of the highest productivity, laid out to enable handling the work with the fewest possible steps.

Die Casting Nickel Solution

Q.—The enclosed solution is die-casting nickel. It is from a 100 gal. tank. The distance between the anode and cathode rods is 7 inches.

When a high voltage is applied while plating, the edges burn badly; when a low voltage is applied, streaking occurs.

Can you analyze this and please tell us the trouble.

A.—The analysis of the sample submitted is:

Nickel	2.21 ozs./gal.
Chloride, as amm. chloride	6.14 ozs./gal.
pH	6.6

A die cast nickel for usual type of work will have about 2 ozs. of metal and not over 2 or 3 ozs. per gallon of chloride. The pH should be about 6.0.

Part of your trouble is due to the high chloride which will cause the zinc to be attacked before nickel can be deposited. The pH should also be lower. Also, due to the attack of the zinc, the solution is probably contaminated.

The chloride can be reduced by removing ½ of the solution and adding water. To remove the zinc the method of plating out can be followed. To do this bring the pH down to 5.2 and electrolyze the solution on dummy cathodes for several hours, or overnight, stirring occasionally. After this treatment bring pH to 6.0 and add nickel salts to bring up metal content. (About 4 ozs./gal. of single salts, can be added).

In view of the amount of work necessary to put your solution in good condition it would probably be of more value to make up a new solution as you have 100 gallons which will cost approximately $15. using a formula such as:

Single nickel salts	9 ozs.
Sodium sulphate crystals	10 ozs. (up to 22 ozs. for recessed work)
Ammonium chloride	2 ozs.
Boric acid	2 ozs.
Water to make	1 gal.
pH	6.0

—G. B. H., Jr.

Electric Cleaning

Q.—I have been using electricity in the cleaning tank for some time, I have steel anodes using the double polarity.

Please advise me which is the best first, using work for cathode, and then vice versa or the other way around. I have heard different ways of doing this but would really like to know the right way.

Also advise on the amount of current and voltage to use.

A.—The general procedure used in electro-cleaning of metals in alkaline cleaning solutions is to first make the article to be cleaned, the cathode and then finally the anode. The time required for each operation depends entirely upon the nature of the materials to be removed and the type of metal.

In the cleaning of copper and copper alloys such as the brasses, it must be borne in mind that such metals tarnish very readily and that care should be exercised in their cleaning. Under ordinary conditions making the article to be cleaned the cathode for about ½ to 1 minute and then the anode for just a few seconds, will suffice. Longer time for articles made of iron and steel are necessary for both cathode and anode cleaning.

In the cleaning of zinc base die castings, cathode cleaning should only be used.

A pressure of six volts directly on the cleaning tank will be sufficient for most types of work. The wiring to the tank should be of sufficient capacity to carry the current for larger tank loads.

The solubility of both ammonium chloride and borax is relatively high in boiling hot water.—T. H. C.

Etching Methods

Q.—In several of your articles on etching you speak of using perchloride of iron but do not tell the amount of perchloride to use. Please give me data on the proper etching solution to use for copper and also for pewter.

In one of the issues a transfer etching ground is given. It is referred to as an etching ink. Could you tell me just how this ink is used? How is this ink put on the transfer paper?

A.—The strength of the iron perchloride can be from full carboy strength to any dilution necessary to suit the requirements of the particular job.

A steel plate is engraved with the desired design. The engraving is filled with ink and the surface wiped off. Then the design is picked off by a roller or paper and transferred.

—T. H. C.

Rubber Linings—An Important Factor in the Electroplating Industry

Resistance to chemicals and insulating properties are the prime characteristics. No "poisoning" of solutions. A new hard rubber with improved physical properties.*

By DR. H. H. HARKINS

In Charge of Rubber Lining Development, United States Rubber Products, Inc., New York.

THE application of rubber to chemical equipment is a relatively new development in the rubber industry. People began the real use of rubber on chemical equipment about fifteen years ago, and its use in this connection has steadily increased.

As you may suspect, there are places where it can be used successfully and other places where it cannot. In those places where rubber is applicable we have the problem of fabricating a specific rubber compound best suited for the purpose. Every time rubber is used on chemical equipment, this special problem must be considered. Therefore, it is highly important for the rubber manufacturer to know the conditions under which rubber is to be used in order that the most useful type of rubber compound may be supplied. Much difficulty is encountered in practice because insufficient information concerning operating conditions is given to the rubber manufacturer.

Rubber has been used successfully as a lining for both wood and steel tanks. Due to the fact that steel is a standard material, easily fabricated to any size or shape, the use of rubberized steel equipment is becoming increasingly popular. When we consider the enormous amount of steel used in the chemical industries where it is exposed to severe corrosive influences, we can readily appreciate the advantages of rubber covering. An important instance is the pickling of steel, in which rubberized tanks are widely used. Such equipment, under many conditions, can be used indefinitely without serious disturbance from "Old Man Corrosion." Not only will rubberized equipment stand up, but it will also prevent contamination of product and permit all-around clean operation. In the numerous cases in which cleanliness is of vital importance for successful manufacture, rubber is often the solution to the problem.

Chemical Resistance

Inorganic bases such as caustic soda do not corrode iron or steel but the solution will pick up iron and become contaminated. For this reason, it is necessary to apply a protective coating to the steel vessel. Rubber resists caustic satisfactorily and does an excellent job of preventing contamination when properly compounded. Rubber also satisfactorily resists most inorganic acids, principal exceptions being nitric, chromic and strong sulphuric.

As to plating solutions, rubber compounds can be provided which resist most plating solutions satisfactorily—except those baths containing chromic or nitric acid. However, the fact that a rubber lining will resist the plating solution satisfactorily does not mean that all the problems are solved. Certain rubber compounding ingredients seem to "poison" plating solutions and care must be taken to avoid them. The rubber lining in a plating tank must not only resist the solution; it must not give off "poisons" that will prevent good deposition. Also, it must remain a good insulator even though used under a hot solution. Once the lining becomes a conductor of electricity, trouble starts. A hard rubber lining as free as possible from the ordinary compounding materials and cured to give a dense compound, absolutely free from porosity, and highly water resistant, seems to be the best for most purposes. Even then, high temperatures and high current densities may cause some trouble. However, rubber is probably the best material available for plating work, since it resists acids, alkalies and hot water. There are very few coating materials with the right physical properties which have these desirable chemical properties.

The foregoing brief discussion on chemical resistance gives a fair idea of the conditions under which rubber can be used with success. Let us see how rubber fits into the different classes of corrosion problems. *F. N. Speller* has divided corrosion problems into five classes or conditions under which iron or steel will deteriorate.

1. *Atmospheric corrosion.*

About 80% of the steel used falls in this class. Rubber has little utility here, as paint will do a satisfactory job. The steel may also be electroplated, especially if appearance is a factor. Certain rubber derivatives, like chlorinated rubber, are finding use in the form of lacquers or paints to protect steel under atmospheric conditions.

2. *Under water corrosion.*

Properly compounded rubber is excellent for preventing the corrosion of steel under water at atmospheric temperatures. The higher the temperature of the water, the shorter the life of the rubber cover, but hard rubber will protect steel at the boiling point of water very satisfactorily.

*Abstracted from a paper on Rubber Linings—An Important Factor in the Chemical Industry, read by Dr. H. H. Harkins before the Detroit Branch of the American Electro-Platers' Society, April 1, 1938. This paper will also appear in full or in abstract in The Monthly Review of the American Electro-Platers' Society for June.

3. *Under ground corrosion.*

There is sufficient moisture, acid, alkali, an oxygen in the soil to cause severe corrosion of pipe used for carrying water, oil or gas. The corrosion of these pipe lines results in the loss of millions of dollars each year. Of the hundreds of coating materials tested, there are only a few which show promise. According to a recent article (J. I. E. C. March 1938, page 294), there are only two coatings which show real merit: one is an asphalt coating covered with a film of celluloid or nitrocellulose plastic. The other is a coating of rubber.

4. *Chemical corrosion.*

This includes corrosion of steel by solutions and vapors, acids, salts, bases, etc. The rule to remember in applying rubber is to keep it away from concentrated solutions of strong oxidizing acids such as nitric acid or chromic acid; also to avoid hot oils which make the rubber swell and disintegrate. Outside of these limitations, rubber may be considered for any chemical or aqueous solution up to temperatures as high as 212° F.

5. *Electrolytic corrosion.*

Rubber is a good insulator, and this property coupled with its chemical resistance, makes it valuable as a lining for tanks through which an electric current passes. If the solution is hot, it is highly important to select hard rubber compounded for maximum resistance to diffusion of water vapor through it.

6. *Chemical corrosion plus abrasion.*

This is really a sixth type of corrosion problem which may be included in this discussion. It arises wherever we have an acid or salt solution carrying particles in suspension when the solution is agitated. Since soft rubber is highly resistant to abrasion, it is obvious that rubber is very useful in chemical engineering problems of this type.

Construction No. 1 is sometimes applied to small metal parts or to larger parts not subjected to sudden temperature changes. The reason for this is that hard rubber has a tendency to come loose from the metal. Construction No. 2, No. 3 and No. 4 are widely used. If we compare these four constructions we find their resistance to impact to be as follows:

No. 1 is best as long as it stays on the metal.

FACTORS IN TANK LINING

I CHEMICAL RESISTANCE
- A INHERENT RESISTANCE OF COMPOUND
- B LINING MUST BE FREE FROM PHYSICAL DEFECTS

II ADHESION TO CONTAINER WALL AT ALL TEMPERATURES

III RESISTANCE TO TEMPERATURE CHANGE
- A SOFT LININGS
- B HARD LININGS

IV IMPACT RESISTANCE AT ALL TEMPERATURES

V CONTAMINATION OF LIQUID

VI COST AND LENGTH OF SERVICE

VII LINING APPLIED AT FACTORY OR IN FIELD
- A SOFT RUBBER
- B HARD RUBBER

No. 4 is the best over a temperature range.

No. 3 next.

No. 2 poorest.

This statement of the performance is correct, if we strike the pieces on the rubber side. If we strike the construction on the metal side and bend it, we find a different set of relations.

Going back now to construction No. 1, I wish to discuss what the ideal lining would be. Hard rubber next to steel is considered impractical, or at best a bad risk where a large steel surface is concerned. Let us consider, however, the enormous advantages which would be gained if hard rubber had a few different properties:

1. Suppose it had the same coefficient of expansion as steel. We would then not encounter the difficulty mentioned, namely, that it strips from the metal when the temperature is suddenly changed.

2. Suppose it had a reasonable stretch, and were strongly bonded to steel. The difficulty encountered would not then exist. The temperature could then be changed suddenly without danger of stripping from the metal.

A New Hard Rubber Lining

There is experimental evidence to indicate that it is possible to produce a lining with these desirable properties:

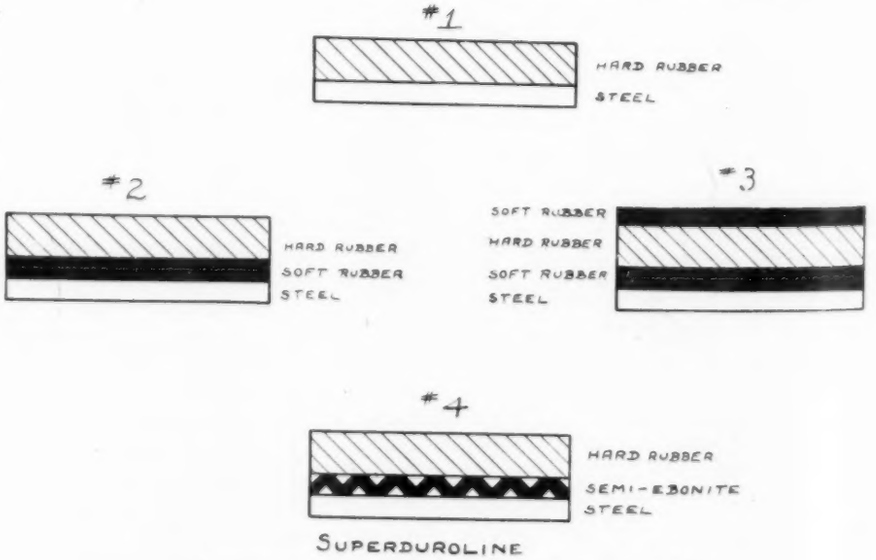
(a) The lining is made by compounding hard rubber so that we obtain, in effect, a flexible ebonite. Its chemical resistance is fully equal to ebonite and in some respects better.

(b) The lining will adhere directly to steel with a very firm bond.

(c) The lining will withstand sudden temperature changes without stripping from the metal. Experiments have shown that small metal parts covered with this material and bonded to metal would withstand a sudden change in temperature from 212° F. to —20° F. without coming off the metal, whereas ebonite or semi-ebonite would strip completely from the metal under the same conditions.

(d) The lining is somewhat softer than the ebonite and would therefore, have less resistance to penetration by sharp objects. The destruction of rub-

HARD RUBBER CONSTRUCTIONS



SUPERDUROLINE

Important hard rubber constructions available

ber by gouging, however, has been greatly over-emphasized. If there is any real mechanical action, or gouging to which the inside of a rubber lined tank is subjected, it is customary to place a sheathing of brick over the rubber to protect it from sharp objects.

(e) The lining has no objectionable odor, and properly compounded, does not impart appreciable color to clear solutions in contact with it.

(f) The lining is flexible over a wider range of temperatures than semi-hard rubber. It can be bent suddenly at low temperatures (—20° F.) without cracking. Experimental tanks carrying this lining have been struck on the outside and the metal bent through an appreciable angle without cracking the lining. The tank will stand this abuse at ordinary temperatures, and in cold weather when a tank is likely to be damaged by a mechanical blow during shipment, or after it is in use.

(g) Where the sixth class of corrosion problem (chemical corrosion plus abrasion) prevails, a soft ply of rubber can be placed over this special lining to take care of the situation.

(h) The lining resists oxidation as well or better than ebonite.

(i) Its resistance to chemicals is fully equal to ebonite.

(j) Its resistance to penetration by water vapor is fully equal to ebonite.

(k) Electrical properties are equal to ebonite.

The properties of this new material are such as to make it very promising in the chemical field. It should be of particular value in plating tanks.

At the present time this new lining material is in the experimental stage, and some difficulty has been encountered in bonding it firmly to metal. Further study of it is necessary, and is in progress. I am mentioning the properties of this material and the construction to show that by changing the properties of ebonite we may hope to arrive at a homogeneous, one-ply lining (or at the most two plies) having the long desired properties—high chemical resistance and moderate flexibility over a wide temperature range. We would come one step closer to the ideal lining material and eliminate the necessity of complex two or three ply constructions. Also, in hot solutions the homogeneous lining would have the obvious advantage that the lining consists entirely of material which has maximum chemical resistance. This discussion illustrates the objectives which we are striving to attain in the field of rubber lined chemical equipment.

Lining a Tank with Rubber

The first step is to see that the tank is built to specification. The surface is then sand-blasted to remove rust, scale or grease. The adhesive is then applied. The rubber compound is calendered to the required gauge, using several plies calendered together to insure freedom from pinholes. This sheet of calendered rubber is then carefully rolled onto the surface to be covered. Care must be taken to see that no air is trapped between rubber and metal, as this will result in a defect in the cured lining. After the lining is in place on the tank, it should stand at room temperatures for 24 to 48 hours before curing in order that the solvent used in cementing it down may evaporate. If solvent is trapped in the rubber, it is likely to cause porosity in the cured lining. The tank is then placed in a vulcanizer and heated under steam pressure at a temperature sufficient to vulcanize the lining. During this heating operation the lining is not only vulcanized but becomes firmly bonded to the steel.

After the tank is cured it is checked with an electrical test to make certain that the lining is free from porosity or other flaws. No rubber lined tank is allowed to leave the factory until it passes this electrical test. If a defect is found, it is repaired.

The above discussion refers to tanks cured under pressure. It is also possible to apply either soft or hard rubber to tanks without using temperatures higher than 212° F. Soft rubber may be successfully applied at room temperature.

In a typical installation a plating tank is lined with hard rubber 3/16″ thick. There is an additional layer of soft rubber ⅛″ thick around the top of the tank and on top of the anode bar supports and clips. This layer of soft rubber serves to prevent mechanical abuse on the edge of the tank and further insures that the anode bar supports will tolerate the required load.

Advantages of Rubber Lined Tanks

The chief advantages of rubber lined tanks for plating solutions are:

1. They cut down current losses and enable a constant current density to be maintained.

2. Properly compounded rubber will not contaminate the plating solution. This is of vital importance in

Plating tank with hard rubber lining

securing the proper type of deposit.

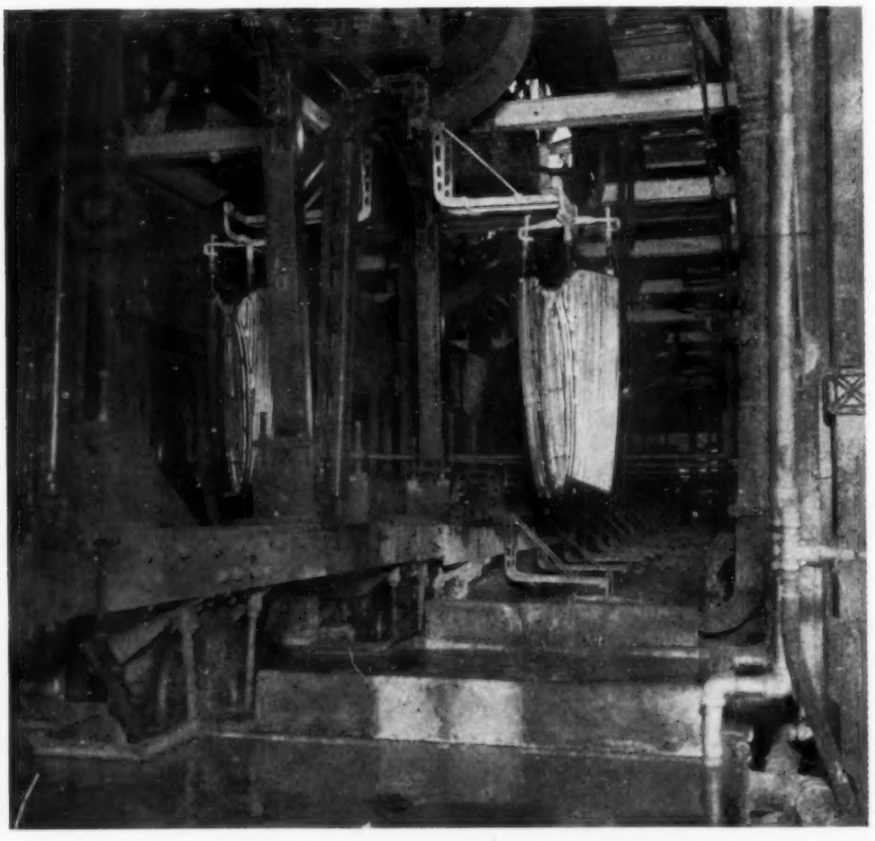
3. When a rubber lined tank is injured, corrosion will be confined to the point of injury. The corrosive solution will not creep between the rubber and metal. Moreover, the injured portion can be easily repaired on the job without difficulty.

4. Rubber lined tanks can be used successfully for a long time, at little or no maintenance cost.

Rubber is applied to tanks in sheet form. In the case of metal parts with odd shapes or with many holes, such as plating racks, it is necessary to cover the parts by a different method. Complicated metal parts can be covered by the latex dip method. In this way a uniform layer of rubber can be laid down on any sort of metal part. While we have had no extensive experience with latex coated racks, we have had a number of encouraging reports on racks coated with latex hard rubber.

The value of rubber in plating equipment is dependent on its chemical resistance and its electrical properties. We may now consider a few facts concerning the electrical properties of rubber.

Obviously when using rubber in contact with a solution through which an electrical current is passing, the electrical property of the freshly cured dry stock is not what really counts. The lining, in order to function properly, must remain a good insulator after soaking in the plating solution. If the rubber is wet through it will become a conductor and therefore, will "plate through." While in general this does not happen, it has happened, and the trouble will occur more readily with higher operating temperatures. This problem deserves further study.



A portion of a large plating installation. All lined tanks have 1/4" thick rubber lining. Photo shows radiator grilles as they emerge from nickel solution toward rinse tanks. The inverted U shaped contrivances in foreground are portions of the conveyor which elevate the grilles from one tank and lower them into the next tank. Each of the arms appearing over the solution in photo is a grille bracket and each bracket holds four grilles. These grilles are first acid washed, then copper plated, rinsed, then nickle plated, rinsed, then chromium plated. The acid and nickle solution tanks are rubber lined. The photo shows only a small portion of this plating equipment. Over to the left of this section is located an equally large plater for radiator shells, also lined with U. S. Permobond. The complete time for plating a grille is 17 minutes.

It appears that hot water is not the only factor causing rubber to lose its insulating properties in a plating tank. Certain chemicals added to plating baths, such as naphthalene and phenol sulfonic acid would tend to cause rubber to become a conductor. These chemicals are soluble in water and slightly soluble in rubber. If rubber absorbs one of these acids, it is obvious that it will then be a poor insulator. Hard rubber compounds can be supplied, however, which will satisfactorily resist baths containing the sulfonic acids.

Many platers have felt that plating through is the result of defects in the rubber; defects present when the tank is received. While it is a fact that porosity of the lining would cause immediate plating through, I am referring to the fact that the lining can become a conductor even though it is free from physical defects. I believe that the trouble can be minimized or eliminated entirely by the following precautions:

(1) Start with a rubber which is as free as possible from non-rubber constituents; i.e., water solubles. In other words, the place to start is with the latex as it comes from the tree.

(2) Use little or no filler or select a filler which will render the stock more water resistant.

(3) Cure to a rubber as hard and dense as it is practical to make; or else select a plasticizer for hard rubber which is fully as good as ebonite with respect to electrical properties and water resistance.

By taking these steps, I believe it will be possible to reduce plating through to a minimum, even at operating temperatures as high as 180° F.

Since rubber resists acids, alkalies and water, it is useful not only in the plating tank, but in the wash and acid tanks preparatory to plating.

The technique of lining tanks with rubber is being constantly improved. Due to the availability of new synthetic rubber-like materials and aided by further studies in compounding, it should be possible to effect further improvement in rubber compounds for specific uses.

Batch Washing, Rinsing and Drying Plated Work

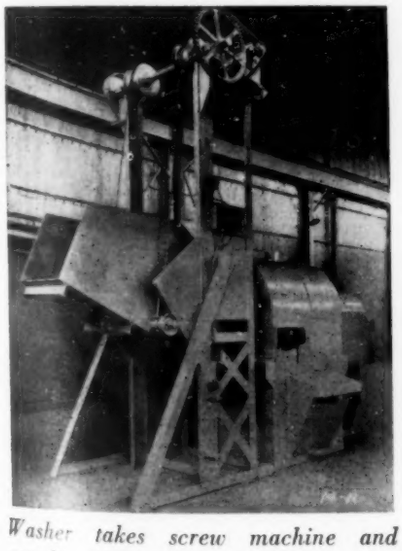
The plating room of one of the large motor factories is using to great advantage, a combination of a batch washing machine with a rinsing and drying unit.

Most of the work being handled is zinc plated. There is also a small amount that is cadmium plated. All of it comes to the cleaning department directly from the screw machine and punch press department. It is transported in buggies which hold approximately 12 cu. ft., or in shop barrels holding 6 cu. ft. The batch washer is equipped with a power loader to handle either buggies or barrels.

As the drum of the washer has a capacity of 6 cu. ft., in loading the work from a 12 cu. ft. shop buggy, the buggy is elevated and half the load charged into the drum at one time.

The washing unit is so constructed that the work is held in the drum and is gently agitated while the drum is rotating in one direction, and is discharged automatically when the drum is rotated in the opposite direction.

The machine is equipped with a steam heated tank and a pump, providing a constant stream of hot cleaning compound that is circulated over the work during the washing cycle. This method of cleaning removes not only the press grease, but also any burrs which the presses may leave, as well as the rolling lubricant that is on the cold rolled steel when it is received. Thorough cleaning takes from five to fifteen minutes per batch, depending on the condition of the work. The cleaning is sufficiently thorough to allow the work to go directly to the plating barrels from this unit without any pickling.



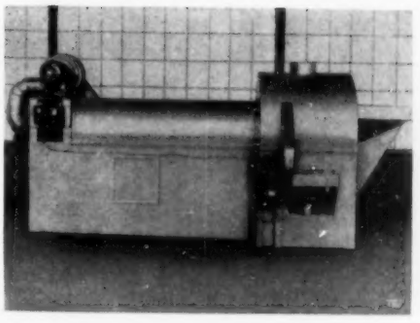
Washer takes screw machine and punch press products, cleans them before plating

The work discharges from the batch washer into a gated hopper, from which it goes directly into the plating barrels, which are of the type that may be removed from the tank by a monorail. These plating barrels are set on a rack at the chute from the gated hopper and are filled directly from the hopper.

After plating, the work is discharged from the plating barrels directly into the rinse and dry unit. This machine is equipped with a hopper of sufficient width to receive the work directly from the plating barrels, hung on a monorail. The washer consists of a perforated cylinder which rotates submerged in hot fresh water. The whole batch of work is gently agitated in the water to give it a hot rinse, and is automatically fed at the proper rate into a drying screen attached to the drum. The worm in the drying screen feeds it through at the proper speed for drying.

The work is dried by heated air blown directly on it through a pipe mounted in the center of the screen. The fan draws the air through a unit steam coil in the base of the machine and thus the air is circulated. An adjustable damper allows the proper amount of fresh air to be added to prevent saturation.

Some of the work is not plated but has to be cleaned before painting. These parts must be washed, rinsed and dried. Consequently the two units are so arranged that the work may be discharged directly from the batch washer into the rinse and dry unit, or it may be discharged from the washing unit directly into the plating barrels without passing through the rinse and dry unit. Furthermore, as above described, the plated work may be discharged directly from the plating barrels into the rinse and dry unit without passing through the batch washer.



Washed and plated work is dried in this machine

Thus, these two units handle all the cleaning, rinsing and drying in this department with a minimum amount of labor, since by means of the power loader, the work is charged directly from the shop receptacles into the batch washer and feeds from the batch washer directly into the plating barrels without any lifting. After being plated, the work in the plating barrels is dumped from the monorail directly into the rinse and dry unit, from which the work is then delivered to the shop receptacles. This elimination of all lifting of the work either in loading or in the drying, has reduced the amount of labor required approximately 60%. The washer and the rinsing and drying machines are standard items, manufactured by N. Ransohoff, Inc., Cincinnati, Ohio.

Streaky Silver

Q.—I am sending you a silver solution for analysis. It plates streaky.

A.—The analysis of the silver solution is:

Silver	3.8 tr. ozs./gal.
Free cyanide	2.43 ozs./gal.

For the above silver content you could increase the cyanide content up to 5 ozs. per gallon. The carbonate content should be about 5 ozs./gal. If trouble continues give original ingredients. Streakiness may be in composition of solution but may also be in preparation of work and suggest this angle be investigated. Use slight agitation and preferably less than 1 volt pressure. See "Platers' Guidebook" for silver formulae.

—G. B. H., Jr.

Hot-Dip Galvanizing Practice

Pickling, galvanizing and protection of surfaces by lacquering have shown important improvement.

By WALLACE G. IMHOFF
Consulting Engineer, Vineland, N. J.

Pickling

Equipment

The rapid strides made in pickling equipment in the past five years may be best indicated by saying that the work called the process of pickling, has changed to the art, or science of pickling. The filth, the terrible conditions of the old pickling department are fast disappearing under the heavy pressure of the modern pickling equipment that is available.

The past year has seen many innovations in equipment. The acid-proof, non-leaking brick tank has forged ahead replacing many of the old leaky tanks still left in the industry. The development of modern strip steel has accelerated the exit of the former inefficient equipment, and abominable conditions. Now we have the compact continuous pickler. It fits in a very limited space, the tanks are equipped with covers, and have fume outlets, and each acid compartment is equipped with a combination syphon and overflow device which maintains proper liquid level at all times.

Waste acids from the pickling department have always presented a difficult sewage problem. Rubber lined steel sewer pipe has been developed for handling this waste acid. Sleeves gaskets, and all other parts also are rubber lined. Disposal of this waste acid has now been satisfactorily solved.

Pickling Methods

The use of electricity in pickling has been investigated further. An interesting fact is that at least one type of scale consists of 70% FeO, 28% Fe_3O_4, and 2% Fe_2O_3.

Inhibitors

On account of the high costs of materials and labor a number of companies which formerly showed no interest in using inhibitors in their cleaning departments, are now finding it very beneficial and economical in producing a decided saving in their acid consumption and metal loss by using a good strong undiluted inhibitor in their pickling or cleaning departments. The cost of the inhibitor is more than compensated by the effective saving in acid and metal consumed per ton of metal cleaned. The cleaning operations are improved and from 1% to 2% of the metal is saved which was formerly converted into ferrous sulphate. Again a maximum temperature of 170 degrees Fahrenheit should be developed to produce a better cleaning practice. This can be accomplished with high temperature inhibitors, which have been developed to the point of a high concentration so that one (1) pound of these inhibitors is sufficient to control 1,000 pounds of 60 Degree Baume acid in the pickling solution. This is the lowest concentration which has ever been developed in the practice of cleaning ferrous metals with an acid solultion.

Galvanizing

Zinc Coatings

Two coils of farm fence were exhibited at the Metal Congress, Atlantic City. The one was dull and unsightly, and had a weight of ½ oz. of zinc per square foot; the other was very bright, smooth, and metallic, and had a weight of zinc coating of 1 oz. per square foot. The poor coil had a coating of zinc-iron alloy due to the method of wiping; the other had a heavy bright zinc coating giving a clean bright metallic zinc finish. Study and improved methods in the past year have accomplished this change giving a far superior zinc coating.

Covered Welding Rods

The problem of covered welding rods has received much attention in the past year, and an intensive research covering the difficulty has been in progress by the American Hot-Dip Galvanizers Association, Inc., to try to get relief. The heavy vicious welding scale from these covered rods cannot be removed by ordinary cleaning methods at the disposal of the galvanizer, and the combined efforts of the American Welding Society, manufacturers of welding rods, and their Metallurgists have all been actively engaged in the past year investigating the problem. As at least a temporary relief those companies manufacturing welding rods have signified which one of their welding rods is best adapted to fabricating steel products that are later to be given a hot-dip zinc coating. The problem is still not solved, but it has been suggested as at least a temporary relief, for companies doing welding on articles that are later to be galvanized, that only the welding rod recommended by the maker for that type of work be used.

Lacquers for Protecting Zinc Coatings

The American Hot-Dip Galvanizers Association has also made an intensive study of various types of lacquers for protecting zinc coating finishes. Many of the lacquer companies have very actively helped in this work and it may not be long until it will be a practical thing to have zinc coated articles "wrapped in cellophane" too. There are of course many difficult problems involved, such as fire hazards, simple mechanical dipping, water clear prod-

uct, costs, and other factors. There are hundreds of millions of square feet area of galvanized surface made every year, and the market for a suitable product is enormous. There is hope that a satisfactory product will appear in the near future.

Repair of Zinc Coatings

There are many times that for one purpose or another it would be a big advantage if a zinc coating could be properly repaired. The purpose of the article may be such that either in construction or otherwise the coating may be damaged. It is now possible to repair such places by a solder flux.

Preparing Zinc Surfaces to be Painted

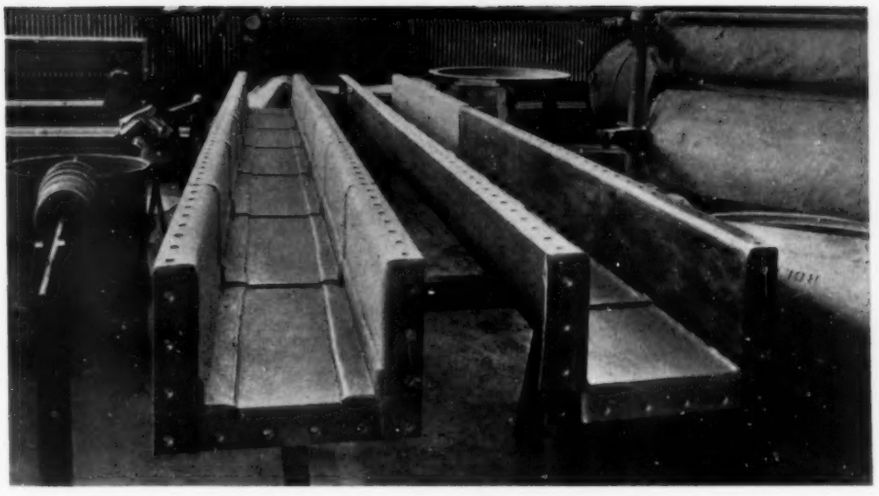
The past year has also been a very active one in preparing zinc surfaces for painting. Several proprietary mixtures are for sale and other formulas and materials have been suggested in the literature are very satisfactory.

Galvanizer's Committee

The Galvanizer's Committee has been very active in the past year. At the spring meeting in St. Louis a number of very valuable papers on hot-dip galvanizing were presented. "*Developments in Galvanizing Wire and Sheets*" was presented by *U. C. Tainton*; "*Metallizing or Spraying Zinc*" by *William C. Reid*; "*Use of Pure Zinc in Hot Galvanizing*" by *J. J. Enlow*; "*Fluxes*" by *L. T. Baldwin*; "*Tube Galvanizing*" by *P. C. Ely*; "*Rolls for Galvanizing*" by *J. A. Succop*; and "*Inhibitors*" by *Walter G. Trench.*

American Hot-Dip Galvanizers Association, Inc., Pittsburgh, Pa.

A year of remarkable achievement has just passed for the American Hot-Dip Galvanizers Association, Pittsburgh, Pa. Under the able leadership of *Thomas Gregory*, President, *Stuart J. Swensson*, Secretary, and other officers, and members of the Association. A very fine booklet entitled, "A Guide to Longer Life for Iron and Steel Products" was released. This little booklet covers in a very simple way the value of hot-dipped zinc coatings as a protection for iron and steel against corrosion. In addition to this booklet 25,000 folders were sent out to architects, engineers, etc. and all those interested in knowing about the value of zinc coatings for protecting various iron and steel products. Reference is made to sixteen sets of Standard Specifications for zinc coatings, and much other valuable data and information on hot-dip galvanizing is included. The Association also published a monthly bulletin full of live valuable material on the value of zinc coatings, and various technical problems in galvanizing, besides much other information of much value to galvanizers, and companies interested in hot-dipped zinc coatings. Much outside service of a technical nature was also given to those interested in hot-dip galvanizing.



Lining 20 ft. sections of steel sewer line with 3/8-inch Triflex for disposal of spent acid from continuous strip pickling tanks. Note Triflex expansion joints. (Courtesy of The B. F. Goodrich Company, Akron, Ohio).

Plating on Pulp

Q.—We are sending you in an attached package samples of some pulp products which we are desirous of nickel plating.

We have tried plating these products in our plating room, but have had very mediocre success.

A.—The procedure that can be followed to plate the samples submitted is as follows:

1. Apply 3 or 4 coats of a very thin shellac. Use 1 lb. shellac to one gal. alcohol (U. S. Den. Formula 10). Allow to thoroughly dry between coats.

2. Spray with a copper bronze powder. Powder must be free from grease. Suspend powder in a lacquer low in gum (silver lacquer). Lacquer people will supply this upon request. Dry.

3. Suspend article in acid copper solution, such as one composed of copper sulphate 27 ozs., Sulphuric acid 6.5 ozs., water to make 1 gal. Make contact to various parts of object with copper wire, placing the point of the wire against the surface. Article must be wetted before plating.

4. If a matte finish is suitable, the copper plated article can be removed and transferred direct to the nickel plating solution. If a polished surface is desired, enough copper will have to be deposited so that the coating will withstand the pressure of a polishing wheel.

A nickel plating solution can be made from:

Single nickel salts	14	ozs.
Double nickel salts	2	ozs.
Ammonium chloride	3	ozs.
Boric acid	3	ozs.
pH	5.8	
Water to make	1	gal.

—G. B. H., Jr.

Chromium Plating Small Articles in a Basket

An economical method of plating work which is expensive to rack or wire.

By E. F. INGERSOLL

Metal Finishing Consultant, Denville, N. J.

THE use of a basket in chrome plating small articles is now becoming standard practice in many plants. This is particularly so in plants where a large amount of the production is small parts. In this paper the author makes no claim of originality nor is it claimed that this is a "cure all" for chrome plating all types of small parts. The practices discussed here have been observed over a period of years.

It is generally understood that this procedure is, naturally, limited. However, it has been found in some cases that articles which formerly were racked can be successfully plated in the basket.

Examples

In one plant the change from rack to basket on certain types of work resulted in the following figures. These costs do not include preparatory plating.

No. 1

Operation	*Cost per M.*
Racking and plating	$0.485
Basket plating	0.134

No. 2. *Larger Item.*

Operation	*Cost per M*
Racking and plating	$0.448
Basket plating	0.214

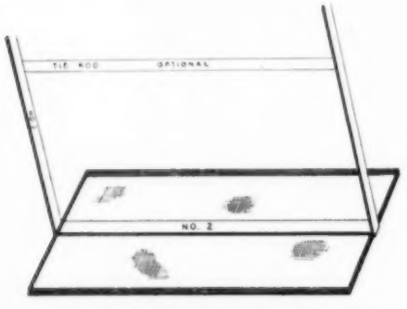


Fig. 1. *Basket complete*

The cost of racking on smaller items is of course greater and savings on basket plating the same are greater in proportion.

In another case the former production of chrome plating on a small rivet was as follows:

Old process	*Cost*
6,000 per hour	$0.10 per M.

Basket	*Cost*
208,000 per hour	0.0025 per M.

The Basket

The size, shape, material and construction of the basket is of great importance for successful operation. We have experimented with copper mesh of from No. 4 to No. 12 mesh and the best results were secured in a basket made of No. 10 mesh. The wire cloth and screen companies supply these various size meshes in different diameters of wire. The No. 10 mesh was tried out in various diameters of wire and .041″ diameter was finally selected as the best for all around purposes.

A basket which could be handled most readily and economically was found to be from twenty inches to twenty-four inches in length by ten to fourteen inches in width, with a half-inch turned up edge around it. The baskets described above will have approximately 580 square inches of wire surface in the 20″ x 10″ basket and 610 square inches in the 24″ x 14″ basket.

Next to be considered in the construction is the size of the lead-in hooks or cathode contact hooks. These are generally of such size as will carry 500 amperes without excessive heating. Bus bar material with a cross section measurement of .3125 sq. in. has been used successfully for this.

The lead-ins used on the baskets mentioned herein were of soft copper, one and one-quarter inches wide by one-quarter inch thick. The length of the lead-ins from cathode rod to basket is preferably enough so that the basket will hang midway between surface of solution and lower edge of anodes. After the copper lead-ins are formed to desired shape, the mesh is then placed over the base section and sweated on. For greater efficiency and better distribution of small pieces of work, another section of copper, of such size as will fit in basket, is placed directly over the part of mesh which has been soldered to No. 1 section and sweated down tightly.

The basket should now be given a good nickel plate. It is now complete except for insulation. This can be one of the several acid resistant paints or lacquers which are now on the market. The parts that should be insulated include the upper and lower center bars and the half inch edge around the basket. The lead-ins should be insulated to a point at least three inches above the surface of solution.

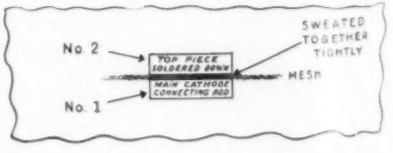


Fig. 2. *Cross section showing construction of cathode connecting rods, where mesh is sweated on*

The cost of material and construction of such a basket should not exceed ten dollars.

The baskets used in this particular case were stripped of chromium at end of each work day.

Preparation of Work

It must be kept in mind that the successful deposition of chromium on any type of work depends largely on the preparatory measures taken before chrome plating.

On work that has been barrel nickel plated before plating in this basket a great measure of success depends upon the composition of the nickel solution in which the work was plated.

The solution must be free of impurities such as traces of cadmium and zinc salts, to insure success in this procedure.

The following method has been used to advantage on small ferrous metal pieces.

Copper plate in solution of analytical content:

Copper metal	3.0 oz./gal.
Sodium carbonate	5.0 oz./gal.
Free cyanide	1.2 oz./gal.
Current density	2 amps./sq. ft.

Room temperature.

To the above solution, before tests were started, were added four ounces per gallon of Rochelle salts. This being a small plating barrel only eighty pounds of work was plated in each batch; this for a period of one and one half hours.

Following this the parts were plated in a nickel solution of analytical content:

Nickel metal	5.0 oz./gal.
Boric acid	1.8 oz./gal.
Chlorides	2.0 oz./gal.
pH	5.8

Room temperature; Brightener added; Current density, 1½ amps./sq. ft.; 99% plus depolarized cast anodes; one and one-half hours.

The above solution was also used on brass parts to be plated in chrome.

Chromium

The work upon removal from the nickel solution was rinsed in two cold water rinses, then allowed to remain in a third rinse until final plating.

A word might be said at this point on current densities. The current densities used depend largely on the type of work and the size of equipment being used. We have used current densities of from one half ampere up to and including one and one half amperes per square inch. Roughly this would be from 400 to 1,200 amperes, with the herein described basket.

The amount of work placed in the basket should not exceed enough to make one layer, in other words the pieces should not be over-lapping or piled up. The reason for this is that the gas given off by the under piece, rises and forms a pocket on the over-lapping piece resulting in a spot which will not plate. However, if the pieces being plated are parts such as screws, rivets etc., the sides may be allowed to touch as this will have no detrimental effect on the work.

Some Causes of Failure

One of the chief causes of failure in this process is the lack of attention paid to solution temperature. If the work consists chiefly of ferrous metal parts the temperature should never be allowed to exceed 82° F., whereas if the work is non-ferrous this may be advanced to ninety degrees. The insulation of the basket must be inspected often to detect any cracks or blisters. If any are found the basket should be reinsulated at once. Cathode contact hooks must be kept clean at all times. If work that has been in storage for some time is to be plated the following procedure can be used.

Clean in alkaline cleaner.

Cold water rinse.

Immerse in a 15% (by volume) sulphuric pickle.

Cold water rinse.

Cold water rinse.

Plate.

Small sheet metal articles of very light gauge material may be successfully plated in the basket if some thought is given to arrangement and length of time in the solution.

Copper Brevities

A 5,000 year-old copper frying pan was excavated at Tepe Gawra in 1930. If it were not in the University of Pennsylvania Museum, it could be used for frying eggs today, so little has time affected it.

The Statue of Liberty in New York harbor, made by Frederic Auguste Bartholdi, is composed of 300 pieces of sheet copper, fitted over a steel framework like a giant jig-saw puzzle.

The only brass fiddle in the world is played nightly in a West End of London cafe. M. Tapponiere, owner of the violin, said it was made from empty French 75mm shell cases behind the Allied lines in 1917.

A modern 40 foot motor boat, or cruiser, contains over one million brass screws, mostly in the hull.

Ancient bronze mortars presented by the druggists of Italy for war material were made into bells, not shells, and will be placed in the Littoria Tower in Addis Ababa.

Oxy-acetylene welding joints in commercial yellow brass pipe. Doing a "tailor-made job." (Courtesy Linde Air Products Co.)

How to Choose the Right Organic Finish for a Specific Product

The best finish must have properties suited to the special requirements of the product. The best test is service. Laboratory tests must be pertinent and comparative, not freaky.

By **W. T. SMITH**
Chemist in Lacquers, Enamels, Synthetics

THE purpose of an organic finish film on the surface of metallic objects is two-fold: protection or of decoration.

Organic finishing materials may be obtained with extreme hardness, or flexibility; resistance to alkali, acid, solvent, moisture, salt atmosphere and perspiration; amenability to buffing; high lustre, and in literally any desired color. It is common knowledge, however, that all of the above properties cannot be realized in a single material. Certain of these properties are available only in high bake enamels, which automatically excludes certain light colors. Other materials, having a high alkali and acid resistance, may lack flexibility or be ill adapted to some methods of application.

The tremendously keen competition between brands of similar finishing materials has rendered the making of the consumer's decisions increasingly difficult. Trade journals, household magazines, buyer's guides and consumer's testing laboratories have all contributed to an effort to regiment the claims of the manufacturers of retail commodities into some rational order and to translate the vendor's claims into the layman's language. The user of industrial materials has no such advisory service at his command, and must face advertising and salesmen armed with little but his own experience and discretion. Often the free agent who supplies unbiased testing information on industrial finishing materials performs this service in such exhaustive thoroughness that the result is a technical encyclopedia involving elaborate apparatus, far overreaching the practical needs of the average consumer.

Tests for Finishes

Almost any quantity purchaser of finishing material must, in order to make a logical discrimination in a highly competitive field, make certain trials or tests to aid him in the choice of brand. Test equipment of varying degrees of practicability has been devised for numerical evaluation of practically every conceivable physical and chemical property. Such tests are made of di-electric strength, adhesion, flexibility, abrasion or wear resistance, weathering, salt spray, moisture and alkali resistance and reaction to various chemical fumes, especially those of sulphur compounds.

Involving delicate apparatus, often of extremely scientific precision, these tests as performed in the various laboratories, are subject to enormous variation and have in common little but the name of the test. Besides the vital factors such as type of base metal, method of preparing or cleaning and film thickness, the greatest stumbling block to precise application of test results to the buying of material is in their interpretation *in terms of practical requirements.*

Common Sense Must Rule

There is practically no means of correlating available properties with requirements, other than the careful consideration of the demands on finish made by the merchandise and the application of common sense to its determination.

Substantiation of the vendors' claims of alkali and salt spray resistance of a finish material, for example, would be of unquestioned interest to producers of laundry, air conditioning or refrigerating equipment. It would mean little in application to the problems of finishers of mechanical pencils or oil burners.

In the case of the mechanical pencil, it would seem that (besides adhesion to the base metal, as elementary) a moderate amount of resistance to chipping, coupled with high wear or abrasion resistance and resistance to perspiration, would fully cover the requirements.

A coal stoker mechanism, on the contrary, would benefit but little from the above characteristics but could claim advantage from a smooth surface for a minimum of dust retention, and from sulphur fume, heat, and oil and grease resistance.

Salt spray and alkali tests would have little significance on business machine finishes under any normal circumstances, nor would perspiration resistance or high abrasive resistance on steel umbrella ribs.

Service Is the Best Test

Therefore, before questioning the properties of a finish, let us consider seriously the specific work a finish on our merchandise must perform. In choosing a material for a definite performance in every day usage, there is no substitute for actual experience. One manufacturer, who produces the world's finest merchandise in his line, a concern with a hundred year record behind a fine old name, tolerates, naturally, only the finest adaptable finishing material that can be obtained. They maintain no laboratories; they make no technical tests. The proposed material is applied, in regular routine process, to a piece of their merchandise which is then kept under observation under normal conditions.

This procedure is so simple that it reminds us of the technique of the green cub reporter who scooped the town in obtaining a photograph of a much publicized, but retiring lady, who had baffled the best devices of the veterans. When asked how it was accomplished, he replied, "I just rang her bell and asked her for it."

The great automotive manufacturers have extensive laboratories but obtain the most conclusive factual data on their product from their proving grounds and from customers' experience.

Laboratory Tests Must Be Made in Parallel

It is not the intention here to deride laboratory tests as worthless. They are of great interest, and provide a short cut to learning a great deal about a material in a short time. Due however to the irregularities difficult to control, mentioned above, it is not infrequently possible to obtain ten different results in ten consecutive tests. The writer has laboratory tested materials, under rigid specification, for a large consumer wherein it was not possible to make this concern's standard material pass their own tests by the methods outlined.

Such tests are pertinent only when run as a *comparative medium;* run in duplicate, preferably on split specimens (both materials on the same piece), applied in the same manner and, as nearly as physically possible, at the same time. When one of the two materials in this fashion has previously been proved by experience, to be suitable to the proposed adaptation, a fair criterion of the possible, parallel qualification of the other is apparent.

It is extremely doubtful if any series of the most exacting laboratory tests will provide an accurate indication of the life, in actual usage, of any organic, industrial finish, without a guiding, check standard, representing a material which has already been proved in performance. An accelerated weathering test result of 50 cycles, or a resistance to an intermittent spray of 20% sodium chloride solution for 72 hours will not tell anyone, without known standards of comparison, how long the finish will stay on a lawn sprinkler which may be used in Texas or Maine.

'Freak Tests'

Freak tests may at times be advocated by either vendor or potential customer, either as a sales "talking" point or a bulwark of sales resistance, as the case may be, in order to provide a dramatic element in the proposition. An example of this is in the still persistent custom of pouring high proof ethyl alcohol on a lacquered surface and igniting it. The net result is a striking pyrotechnic display which may—in the absence of a suitable finished surface—be performed as spectacularly, and as harmlessly, on the palm of the hand.

Occasionally a consumer may discover, quite by accident, that his finish will withstand, for example, a very high concentrated alkali solution. In his glee, in assuring potential vendors that "Our present finish will stand so and so!" he at once sets the aspirant to his patronage to work incorporating that property into *his* material, perhaps at the sacrifice of more valuable and pertinent properties in which the original material excelled as offered.

The result is, not infrequently, a backfire in the form of a material formulated expressly to "beat" a test, and possibly not otherwise well adapted to the consumer's needs.

Open handed, sincere co-operation with the supplier, adherence to *practical, pertinent* and *comparative* tests, based on experience with the problem at hand, are the basic rules for choosing the finish for your product.

Slow Plating Solution

Q.—We are sending a nickel solution for analysis. Plating watch hands; solution does not plate.

A.—The analysis of the sample submitted is:

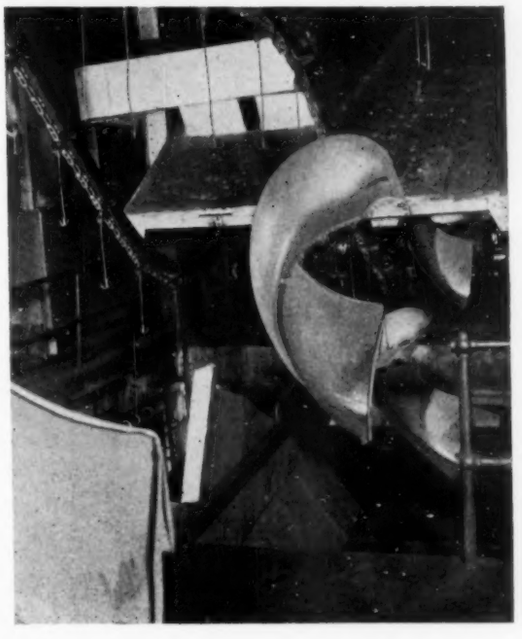
Nickel	2.4 ozs./gal.
Chloride as amm. chloride	2.5 ozs./gal.
pH	5.8

The composition and pH of this solution is suitable and as far as analysis is concerned on the above constituents should give a deposit of nickel.

Suggest you check solution for iron content as this will sometimes cause slow plating. If iron is high remove by adding hydrogen peroxide and filtering or settling out. Other sources of difficulty may be due to a coating, such as an oxide film on the watch hands which is preventing deposition. Also check current into tank with a meter. Clean all connections and tank rods.

If this is a barrel solution trouble may lie in contacts within the barrel. If basket plating, renew basket if it has become built up. —G. B. H., Jr.

Drying Automobile Fenders



Conveyor entry to and exit from the drying oven is at the same end of the oven. Note the "hood" under which the conveyor dips. This device, by preventing escape of hot air, permits material shortening of drying oven length, at the Pontiac Motor Co.

Electrochemists' Session on Electrodeposition

The Electrochemical Society held its spring meeting at Savannah, Georgia, April 27th to 30th, 1938. One of the features of this meeting was a special session devoted to the electrodeposition of metals at which *Prof. E. M. Baker* of the University of Michigan presided. Abstracts of the papers read at this session are given below.

The Causes of Porosity in Electrodeposited Coatings, Especially of Nickel on Steel

By A. W. Hothersall and R. A. F. Hammond

An analysis has been made of the possible causes of porosity in electrodeposited metals. Porosity can be due to an unsound (for example, cracked) condition of the deposit, but in nickel deposits it is usually due to a failure of the deposit to grow completely over the basis metal. The chief causes of this failure are considered to be the presence of non-conducting or poorly conducting areas in the surface of the basis metal (for example, inclusions of scale), the shielding action of gas bubbles or of particles of solid matter derived from the solution or loosened in etching from the basis metal, the failure of the deposit to cover the surfaces of crevices in the basis metal either because of poor throwing power or because of the exclusion of electrolyte by trapped gas. Some coatings may be porous because of the inherent tendency of the deposit to grow only slowly in a lateral direction. This factor is not considered to be of importance in nickel deposition.

A preliminary investigation of the causes of porosity in nickel deposits has been made.

Methods of testing porosity have been examined. The ferricyanide reagent has been shown to attack nickel and this test is therefore unsuitable for thin nickel coatings. The hot water test, originally devised for tin coatings, has been found applicable to nickel coatings.

A method of producing very thin nickel deposits (less than 0.0001 in. or 0.0025 mm. in thickness) in a non-porous condition has been developed. This result demonstrates the possibility of producing thin non-porous nickel deposits. The technique described is of considerable value for the purpose of investigation in providing a reliable and rapid method of determining the importance of various factors in causing porosity. The method consists in using specially prepared electrolytic iron as a basis metal and in depositing nickel from a carefully filtered solution with platinum anodes enclosed in alundum thimbles.

The most important causes of porosity in nickel deposits prepared in still baths on bright rolled steel have been found to be the presence of suspended matter in the solution (for example, very finely divided particles derived from nickel anodes), the presence of inclusions or other solid matter on the surface of the basis metal, and a rough condition of the surface. Bubbles of gas adhering to the surface, or discharged and reformed continuously, do not appear to be a primary cause of porosity since there was no diminution in porosity when bubble formation was inhibited by the addition of oxidizing agents to the solution. The effect of solution pH on porosity did not appear to be important under the conditions used.

A further cause of the porosity of nickel coatings formed on polished steel has been found to be the inclusion of grease or polishing composition in crevices over which a thin skin of metal (dissolved away in etching prior to plating) is flowed during polishing.

The outstanding problems of which further investigation is required would appear to be:

(1) Further investigation of the type of surface imperfection in the basis metal which is responsible for porosity.

(2) A study of remedial methods by which the effect of surface imperfections in the basis metal may be minimized.

(3) A study of methods of polishing and of cleaning prior to plating which would avoid porosity caused by inclusions of polishing compounds.

(4) Determination of the relative importance of different types of solid matter encountered in commercial plating baths, with the object of finding methods of minimizing this cause of porosity.

Commercial Electrodeposition of Cobalt-Nickel Alloys

By Louis Weisberg

The electrodeposition of cobalt-nickel alloys has attained a signficant commercial position within a little more than two years as a result of the discovery that the presence of sodium formate and formaldehyde in the sulfate bath renders it easy to obtain lustrous deposits of the alloy requiring no buffing or coloring after plating. The composition of the solutions used and the operating conditions necessary for producing such deposits are described. The deposits are normally very ductile, and can be bent or twisted without lifting or peeling. Pitting and double plate are rarely encountered. The presence of lead, copper, iron, zinc, and certain organic impurities reduces the brightness and also the throwing power. Brittleness, when it does occur, is due to the presence of impurities. Methods of eliminating impurities to maintain optimum brightness and ductility are specified.

Alkaline Plating Baths Containing Organic Amines

Part II. Copper Plating From Solutions Containing Ethylenediamine.

By C. J. Brockman and John H. Mote

1. Solutions of copper sulfate containing sufficient ethylenediamine to produce a clear blue solution do not deposit copper on iron by contact. They may, therefore, be used for copper flashing steel parts.

2. At various concentrations of copper sulfate and within a wide bath temperature range, bright and firmly adherent deposits of copper were obtained on iron at various current densities.

3. The higher copper concentrations and higher bath temperatures make plating possible at higher current densities.

4. The best deposits were those obtained at 50° C., using current densities from 0.025 amp./sq. in. to 0.20 amp./sq. in. (0.4 to 3.2 amp./dm.²) from solutions containing 50 g./L. copper sulfate.

The Electrodeposition of Manganese from Aqueous Solutions

Part III. A Survey of Several Electrolytes.

By W. E. Bradt and L. R. Taylor

A preliminary investigation has been made of the electrolysis of several manganese salts in aqueous solution. No metallic manganese was obtained from manganese perchlorate or manganese tannate solutions. Metallic manganese at the cathode was obtained upon electrolysis of aqueous solutions of manganese sodium citrate, manganese benzoate, manganese acetate, manganese fluoborate, and sodium citrate containing baths of manganese dithionate, tartrate, formate, fluosilicate, lactate, and acetate.

The best quality of manganese plate was obtained (under the conditions investigated) from solutions of manganese benzoate, manganese sodium citrate, and mixtures of manganese lactate with sodium citrate. This investigation is being continued.

Alkaline Plating Baths Containing the Ethanolamines

Part VI. Copper Plating From Monoethanolamine Solutions.

By C. J. Brockman and C. P. Tebeau

1. Aqueous solutions of copper sulfate containing monoethanolamine did not deposit copper by contact with steel.

2. Solutions of copper sulfate containing monoethanolamine did not produce satisfactory electrodeposits of copper on steel.

3. Solutions of copper sulfate containing monoethanolamine and sodium oxalate in widely varying proportions and within a wide range of current densities gave satisfactory electrodeposits of copper on steel.

4. The best operating conditions were found to be: 76-149 g./L. copper sulfate, 77-151 cc./L. of monoethanolamine, and 25-50 g./L. of sodium oxalate; current density 2.1-11.6 amp./dm.² (28.8-108 amp./ft.²

5. The addition of boric acid to these solutions prevented smooth anode corrosion and made the baths inoperative.

6. The addition of anhydrous sodium sulfate had no effect on the quality of the deposit.

7. The throwing power, in the presence of monoethanolamine, is not as good as in the presence of the di- and tri-ethanolamines.

The Structure of Electrodeposited Copper Alloys

By Walter R. Meyer and Arthur Phillips

1. Lead was the only foreign metallic cation found which effectively "brightened" copper deposits.

2. Nodular treeing was caused by the separate additions of lead, thallium, and cadmium, and dendritic treeing by silver.

3. Periodic structures were obtained with additions of lead and cadmium, and, to a slight degree, with thallium.

4. Lead and thallium caused an increase in cathodic polarization, and silver (in concentration of 0.1 g./L.) a pronounced decrease. An increase in cathodic polarization (except with thallium) was coincident with an increase in brightness and a decrease in polarization, associated with a coarsening of the structures of the copper alloy deposits.

5. Crystallographic data are valueless for prediction of interference effects if the foreign metal deposits as a basic salt or if it causes marked effects on cathode efficiency or polarization.

The Electrodeposition of Copper-Nickel-Zinc Alloys from Cyanide Solutions, Part III

By Charles L. Faust and Geo. H. Montillon

An investigation of the effect of various addition salts to copper-nickel-zinc alloy cyanide plating baths. In these baths, zinc had the most negative and nickel the least negative static electrode potential. The deposition potentials were generally between—1.04 and—1.38 v., depending on the current density and the addition salt used. Salt spray corrosion tests showed that electroplates on steel containing from 17 to 23 per cent nickel, 23 to 37 per cent of copper and 46 to 54 per cent of zinc had a corrosion protection life approximately two-thirds that of a pure zinc deposit of the same thickness. The formation of monovalent nickel compounds in the plating bath is briefly discussed.

The Anodic Corrosion of Commercial Manganese During Electrolysis

By A. E. Edwards and W. E. Bradt

The anodic corrosion of commercial manganese (95 per cent Mn) was studied in baths containing various combinations of manganese sulfate, ammonium sulfate and ammonium thiocyanate, using anodic current densities from 0 to 120 amp./dm. The variation, during electrolysis, of the anodic potential, of the pH of the baths, and of the visible properties of the baths was observed over a wide range of conditions.

Verde Green

Q.—We are sending you attached a sample of verde green finish which is known as U S 22. We would like to know exactly how this finish is produced, step by step and all chemicals and processes involved.

A.—The sample is a corrosion green on a low brass.

A color such as this can be produced from a solution composed of:

Copper nitrate	4 ozs.
Ammonium chloride	4 ozs.
Calcium chloride	4 ozs.
Water to make	1 gal.

Other formulas can be found in the Platers' Guidebook and these can be tried for variations of shade.

An important factor in the duplication of an exact color is the composition of the base metal. Suggest you determine the alloy composition of the sample in question.

The corroding solutions can be stippled on with a sash brush. If necessary, the brush is run in straight lines across the escutcheon. After obtaining the required effect, dry, and clear lacquer. Then applying a wax mixture 50-50 beeswax and carnauba from a camels hair wheel at 1000 rpm. This removes high gloss of lacquer and gives the egg shell finish.

—G. B. H., Jr.

Shop Problems CASTING • METALLURGICAL FABRICATION • ASSEMBLING • • PLATING • FINISHING

Questions from readers relating to shop practice and answers by our associate editors

Brass Solution Changes Color

Q.—Under separate cover we are sending sample of our brass solution originally made as follows:

6 ounces Sodium Cyanide
4 ounces Sodium Carbonate
2 ounces Copper Carbonate
2 ounces Zinc Carbonate
4 ounces Sodium Bi-Sulphite
½ ounce Ammonia
—to one gallon of water—

Only additions of copper carbonate, zinc carbonate, sodium cyanide and ammonia are made as deemed necessary by an experienced foreman.

The tank has a capacity of ninety gallons, with depth of 22″ to 24″. Four high brass rolled sheet anodes are used, having a total submerged area of about two square feet. The two cathode bars are one foot apart and each is about 15″ from the nearer anode bar.

Our work is household ornaments, such as picture frames, candy dish frames, etc. This solution plates well and is fairly constant, being clear and yellow. At present we are attempting to plate a bright green brass which will not require a subsequent brushing operation. To increase the brightness of the plate we have omitted the customary copper plate.

Our difficulty lies in the fact that the color changes in a few hours under comparable conditions; that is, temperature, current and cathode area.

Would the fact that separate parts of an article made of different grades of brass, have any effect on the color of the plate?

The sample sent you worked very well for our needs and would appreciate your analysis of this sample and any suggestions you may have to offer, so that by periodic analysis, or otherwise, we may be able to control the solution.

A.—The analysis of the sample submitted is:

Copper	1.97 ozs./gal.
Zinc	.28 ozs./gal.
Free cyanide	1.82 ozs./gal.

For normal brass plating work the ratio of copper to zinc can be held at 3 or 4 to 1. If above solution is producing satisfactory color for your purposes it can of course be maintained with ratio found best.

The color of the deposit will change with varying conditions of temperature, current and cathode area. This is due to fact that the deposition of either zinc or copper will be favored and cause a change in color. The deposition of zinc is favored if the free cyanide is increased, the current density increased, or the temperature

Use this Blank for Solution Analysis Information

Fill in all items if possible.

Date .....

Name ..... Class of work being plated: .....
Address ..... City ..... State ..... Volume used: .....
Employed by: ..... Solution depth: .....
Kind of solution: ..... Cathode surface, sq. ft.: .....
Tank length: ..... width: ..... Kind of anodes: .....
Anode surface, sq. ft.: ..... Distance from cathode ..... Original formula of solution: .....
REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible.
Use separate sheet if necessary.

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 148 John Street, New York City.

lowered (when the same current conditions exist). Other factors such as carbonate content, color of basis metal, pH of the solution, amount of brightener, composition and crystal structure of the anodes, and anode current density will influence the results. For consistent results attention should be given to all these factors. The limiting carbonate content should be about 10-12 ozs./gal. (Suggest you have your solution checked for carbonate content), the pH should be maintained at the point found best, starting out in the vicinity of 11 pH and varying until the best point is found. The temperature can be about 100 deg. F. The anodes should be of an 80 copper 20 zinc composition.

One possible cause of change in color is due to anode polarization. This occurs with high carbonates and results in a resistance being created at the anodes which requires more voltage be applied to maintain the original current, or, with the same voltage, the current will fall off.

—G. B. H., Jr., Problem 5,653.

Bright Cutting Nickel Silver

Q.—In our new line, we are working a great deal of ten per cent (10%) and eighteen per cent (18%) nickel silver which requires some bright cutting. Our present method is to bright cut, then tub or gloss as required, and then electroplate. We are having some difficulty in maintaining a good bright finish on the cuts and ask if you might suggest any liquid cutter which might aid in the operation.

We have tried turpentine, gasoline, and a little oil of wintergreen, but with no degree of success. Any suggestions you may make will be tried and appreciated.

A.—As we understand your problem, the simplest method of obtaining brightness in the cuts would be to plate first, cut, and then give the article an immersion plating just for color.

This is suggested because if you cut first, any applied deposit will (normally) dull the cut. You do not mention metal being deposited. Then the gloss will only be as bright as the tubbing gives it. If you apply some material to protect the cut you will run the danger of a poorly adherent plate.

—G. B. H., Jr., Problem 5,654.

Brown on Nickel Anodes

Q.—The anodes in my nickel solution get an awful brown and muddy deposit on them. Please tell me how to prevent this condition.

A.—You evidently are using anodes of the cast type and known as 95-97 anode. This means that the nickel content of the anode is from 95% to 97% nickel. The remainder of the material in the anode (3% to 5% of the weight) is made up of iron and carbon. These are added both to facilitate casting of the anode and to improve its corrosion in the nickel solution. Pure nickel anodes are slow to dissolve in a sulphate solution. The present high purity type anodes (99 plus % nickel) contain either a small amount of carbon or of oxygen which improves corrosion.

In the case of the old type 95-97 anode the sludge which forms on the surface is composed of iron and carbon. This can be removed regularly if desired by removing anodes and scrubbing. Many platers allow the layer of sludge to build up, as it will remain fairly firm and stay as a coating on the anode. In this way frequent removal of the anode with resulting disturbance of the solution and introduction of mud due to agitating the anodes, is avoided. Furthermore the view is expressed that the layer of iron and carbon, if not allowed to become too thick is beneficial inasmuch as it acts as a filter medium and prevents coarse metallic particles from coming off the anode into the solution. Some judgment must be used on this, as in some cases the sludge coating will fall off and itself contaminate the solution causing rough deposits or pitting.

The best type of anode to use in order to have freedom from mud is the 99 plus % nickel, rolled depolarized anode. In order to obtain active corrosion of this anode the chloride of the solution must be properly maintained and should be held at least 3 ozs. per gallon and preferably higher. While this type of anode will give no trouble from mud formation, for best results it should be bagged.

—G. B. H., Jr., Problem 5,655.

Container for Alkali Cleaner

Q.—We are manufacturing an electro-chemical cleaner for opticians and jewelers, and occasionally have complaints regarding gold spectacles frames turning black. We are sending you a sample of the chemical we are using.

Enclosed you will find a folder describing the machine. The glasses hang on a stainless steel hook which lowers into the solution. The solution is in a lead-coated pan which acts as the anode. The machine operates on 110 V-AC, stepped down to 12 volts and then through a B & L rectifier.

We would appreciate any suggestions or remedies you have to offer.

The lead-coated pans do not hold up as well as we think they should, becoming pitted and in time little holes clear through. What is your opinion of stainless steel or monel for a container?

A.—Lead is readily attacked by alkalis even if they are only in contact with the metal.

In your case you have a particularly bad condition due to the fact that the alkali is not only heated but the lead is made anode so that solution of the lead will take place readily. This causes the cleaner to become contaminated with lead and this will then be deposited on the work being cleaned.

The proper container to use is plain steel.

For best results use steel anodes, instead of the tank for the positive connection.

—G. B. H., Jr., Problem 5,656.

Copper on Mirror Backs

Q.—Kindly furnish me with any information or sources of information you may have regarding the equipment and method of copper plating the backs of mirrors.

A.—Application of copper to the thin silver on mirrors requires considerable fine technique. The silver is so thin that it does not conduct electricity well and excessive current will cause the silver to lift.

For the beginning plate use an almost neutral acid copper solution with a very low current, ½ to 1 amp. per sq. ft. Plate until well covered. Then transfer to a regular acid copper solution containing 28 ozs. of copper sulphate and 4 to 6 ozs. of sulphuric acid per gallon. Use a low current of 5 to 10 amps. per sq. ft.

—G. B. H., Jr., Problem 5,657.

Metal Casting Digest

Short abstracts of articles of interest to practical non-ferrous foundrymen and metallurgists

By H. M. ST. JOHN
Associate Editor

Lead Bronzes in England and Germany. Anon. Metal Progress, Aug. 1937, page 149. Abstracted from articles by D. P. C. Neave in the Journal of the Institution of Automobile Engineers, July 1937, page 24, and by Willi Claus in Metallwirtschaft, Jan. 29, 1937, page 109.

A review.

• • •

Manufacture and Characteristics of Hiduminium RR. Alloys. J. Towns Robinson. Metallurgia, Aug. 1937, page 131.

By the addition to aluminum of magnesium up to 10%, combined with small percentages of other elements, a series of alloys have been produced both for casting and wrought purposes which, while they are rather more difficult to work and control than the other forgeable alloys, have exceptional corrosion-resisting properties combined with fairly good physical properties. Copper, nickel, manganese and titanium are among the additive elements used. The series includes 10 alloys of which four are recommended for sand casting.

• • •

Copper-Lead Bearings from Metal Powder. Erich Fetz. Metals & Alloys, Sept. 1937, page 257.

A coarse-grain copper powder is mixed with a volatile substance, hydraulically compressed and heated in hydrogen to 900-1000°C. The copper sinters to a sponge-like body left porous by the escape of the volatile matter. The copper sponge is then soaked in liquid lead in a vacuum. Difficulties with lead segregation, experienced in casting high-lead (35% or more) copper alloys, are thus avoided and it is also possible to provide a larger proportion of lead at the bearing surface and a larger proportion of copper at the bearing back, where it is needed to promote adherence between bearing and steel backing.

• • •

Advances In and Present Position of the Use of Electron Metal. Walther Schmidt and P. Spitaler. Z. Metallkunde, Vol. 28, page 220 (1936); Chemical Abstracts, Aug. 20, 1937, col. 5736.

Addition of 0.1% of manganese to ordinary electron (magnesium 91, aluminum 8.5, zinc 0.5%) raises the tensile strength and yield point by 10% without affecting the ductility. For sand castings better strength is obtained with 0.3% manganese. In both cases the alloys should be homogenized by heating at 400-420°C in a fused dichromate bath or in a sulphur dioxide atmosphere to dissolve the brittle beta phase. Examples of the use of both alloys in intricate castings and structures are described.

• • •

The Use of Charcoal in Casting of Copper Alloys. R. J. Keeley. Rev. fonderie moderne, Vol. 31, page 110 (1937); Chemical Abstracts, Aug. 20, 1937, col. 5736.

A study of the action of charcoal in the melting of copper alloys showed that it can prevent oxidation, introduce gases and deoxidize the metal. When used in a crucible the charcoal should be placed on the bottom of the crucible before charging the metal. In an induction furnace, charcoal and metal are charged together, the former serving here merely as cover to prevent oxidation. As an electric arc furnace operates with a reducing atmosphere no charcoal must be employed to avoid formation of blowholes in the casting. The conditions of use in different types of furnaces are discussed.

• • •

A New Alloying Method for Bronzes. R. Ozlberger. Giesserei, Vol. 24, page 251 (1937); Chemical Abstracts, Aug. 20, 1937, col. 5739.

Addition of 0.25% nickel to 92 copper—8 tin bronze gives a homogeneous structure and better physical properties. Substitution of silver for part of the nickel gives even better physical properties and has good corrosion-resisting properties.

• • •

Hints on Brass Shop Practice. N. K. B. Patch. Foundry, Sept., 1937, page 27.

Describes use of dry-sand molds, which the author prefers to skin-dried molds. Green-sand molds are sometimes smoked with an acetylene torch. The ramming and positioning of green-sand molds are also discussed. The principal utility of skim gates is to keep the sprue full during pouring.

• • •

Counter Gravity Die Casting of High Melting-Point Metals. Samuel P. Wetherill. Jour. of the Franklin Inst., Aug., 1937, page 153.

The author discusses the "waning prestige of the casting" which has lost ground to forgings because "designers and engineers must have uniform reliability, known safety factors and mass production low prices." Principal handicaps of the casting are imperfect temperature control, injuries due to exposure of molten metal to the air, the tendency to large grain and weak structure, injurious effect of burned-in sand on tools, high cost due to amount of machining required and number of defective castings found after machining. The article summarizes a series of patents which describe the development of methods to force molten metal into permanent moulds from the bottom, against the action of gravity. Illustrations are shown of brass and bronze castings made in this way. In the present preferred method a refractory crucible, partly surrounded by a combustion chamber, is provided with means for introducing separately melted molten metal and air pressure which bears upon the surface of the metal in the crucible. A tube extending almost to the bottom of the crucible provides a channel through which the metal rises into the mould above. Within a range up to 3000°F any metal can be successfully die cast in this manner. Special means for controlling temperature and timing the removal of the castings are described. An important point is that sand cores may be used. Dies are made in segments, the short lived members of which are cheaply die cast in iron.

• • •

Gases in Metals. P. G. Chaudron. Bull. assoc. tech. fonderie, Vol. 11, page 4 (1937); Chem. Abstracts, Sept. 10th, 1937, col. 6162.

The fixation of gas in metals takes place by chemical combinations such as solid solution whereby the gaseous ions enter into the metal lattice. The amount of gases retained in solid metals varies according to the method of extraction. The new discharge tube extraction yields a greater amount of gases than the well known fusion vacuum extraction method.

• • •

Light Metal Alloys for the Hot Parts of Combustion Motors. P. Sommer. Brennstoff-u. Warmewirt., Vol. 19, page 85 (1937); Chem. Abstracts, Sept. 10th, 1937, col. 6170.

Pure aluminum has a thermal conductivity of 0.52 cal./cm., sec., degree. All alloying materials lower this value. Steel has a greater specific heat per unit of volume than aluminum, while aluminum has a greater specific heat per unit of weight. Increasing the amount of silicon in aluminum-silicon alloys decreases the thermal expansion. A discussion of various aluminum alloys is given.

• • •

Effect of Titanium on Some Cast Ferrous and Nonferrous Metals. Joseph A. Duma. Trans. of the Amer. Soc. for Metals, Sept., 1937, page 788.

This paper is an attempt at an evaluation of the alloying effects of titanium upon the mechanical properties of certain cast metals, namely—low and medium carbon steel, cast nickel-chromium alloy steel, copper-bearing steel, 18-8 stainless steel, and two copper-nickel alloys (straight and inverted monel metals). The paper also notes the effect of titanium upon microstructure, weldability, general corrodibility, machinability, and age-hardenability. The addition to monel of a small amount of low carbon ferrotitanium (0.11 to 0.38% residual titanium) resulted in a remarkably high combination of ductility and strength. Titanium has a similar good effect on inverted monel, an alloy which is sensitive to the slightest variations in composition and must be balanced with respect to silicon, iron and manganese.

Modern Production Equipment

New processes, machinery and supplies for metal products manufacturing and metal finishing

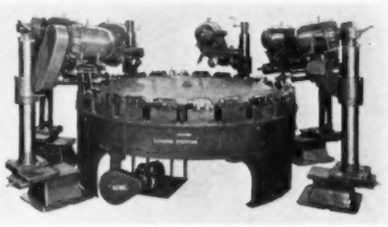
Automatic Six Wheel Buffing Machine

The Acme Manufacturing Co., 1645 MI, Howard St., Detroit, Mich., has developed a new automatic polishing and buffing machine for automotive body hardware, such as trunk hinges, door handles, regulator handles, brackets and other light parts.

The machine consists of a 6-wheel table, 8 ft. in diameter which operates in constant rotation. A variable speed drive for the table is regulated by the turn of a hand wheel. Each polishing lathe is an individual and adjustable unit, set at the table in the correct position and making the correct angle of contact.

Lathe heads equipped with floating spindles make it possible to obtain the correct pressure at the correct angle on the work being polished. They are easily adjustable for curved or irregular work. Being complete units, they can be used in conjunction with other types of holding and conveying equipment.

Various sizes of this type of installation can be supplied.



Acme 6-wheel automatic polisher

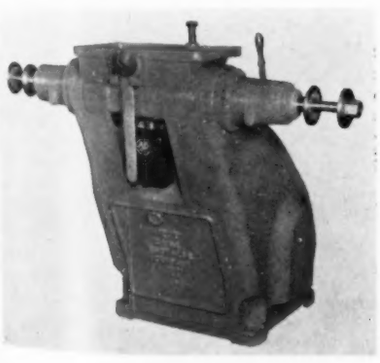
V-Belt Polishing Lathes

Divine Brothers Company, Utica, N. Y., announce the addition of a completely new engineered group of V belt driven lathes to their already extensive line of standard and special polishing and buffing lathes and machinery. This company, pioneers in the manufacture of polishing and buffing machinery and materials, show a complete line of these new lathes, which in appearance are similar to the one pictured here.

This lathe is a precision built machine of compact design with particular attention given to smoothness of operation at high running speeds and freedom from projections which might interfere with the operator or work holding machines. It is available in four sizes: 3, 5, 7½ and 10 HP with continuous duty N.E.M.A. standard motor. Spindle speeds range from 1800 to 3600 r.p.m. Ball bearings are oversize capacity with oil reservoir lubrication.

The flush base, recessed floor bolts and starter box, 12-inch overhang, flush screws and combination start-stop-and-brake lever contribute to the reduction of hazards and flexibility of use. A new and simple means of changing V belts is provided which does not require removing the spindle or disturbing the spindle bearings. In addition to the saving of time, this feature overcomes the expense and difficulty of realigning and readjusting bearings if belt changes become necessary. The manufacturers claim that the entire change can be made within ten minutes.

The base is a single heavy wall casting. Belt adjustment is by means of an external hand-wheel at the rear of the pedestal. Added refinements are a positive spindle lock, large cast composition and tool tray and a convenient wrench hook.



Divine V-belt lathe

Buffing Compounds and Cements

Harrison & Co., Haverhill, Mass., announce new improved buffing compounds for stainless steel, high carbon and other steels, including very soft steel and iron.

They have also added a new 4A cement and thinner used on leather wheels and belts, canvas, felt, and cloth belts, wheels, rolls to their line. They offer to submit samples on request.

Undershoe for Plating Rooms

A new undershoe made by W. H. Long Co., 101 W. Austin Ave., Chicago, Ill., provides the worker with a resilient cushion that absorbs shock on hard floors, prevents slipping on wet or greasy floors. It is made of rubber fabric, similar to that in an automobile tire, the fabric being assembled as indicated in the illustration and equipped with a pair of straps. Three sizes fit men's shoes from No. 6½ to No. 12 and one fits women's shoes from sizes 5½ to 7½.

Long Co. undershoe

Latest Products

Each month the new products or services announced by companies in the metal and finishing equipment, supply and allied lines will be given brief mention here. More extended notices may appear later on any or all of these. In the meantime, complete data can be obtained from the companies mentioned.

Welding Electrodes in a Vacuum Packed Can. Keeping welding electrodes fresh for an indefinite period of time. Harnischfeger Corp., Milwaukee, Wisc.

Bench Model High Speed Precision Profile Grinder. Eliminates costly hand stoning in fitting of dies and punches. Boyar-Schultz Corp., 2110 Walnut St., Chicago, Ill.

Pilot Hole Saw; for drilling round holes in all sheet metals and materials with the exception of iron and steel. Fray-Mershon, Inc., Glendale, Calif.

Alloy Grinder; for polishing and rubber wheeling chrome alloys and other stainless metals; 1/5 HP; 20,000 r.p.m. The Dumore Company, Racine, Wisc.

Oil-Proof Transmission Belt. "Paranite," synthetic material. Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc., Passaic, N. J.

Electric Arc Saw; for cutting iron, steel, any alloy-ferrous or non-ferrous. Cuts are made by means of a controlled electric arc that "leaps" ahead of the saw. Miller Electric Mfg. Co., Appleton, Wisc.

Safety Lathe

Safety is the big feature of this new Mitchell Lathe, recently announced by Frederic B. Stevens, Inc., Detroit, Mich.

Protection for an operator is provided in this Safety Lathe, in the form of a foot operated bar, which is located at the base of the machine and extends completely across the front and partly around each side. When occasion to stop the machine arises, a light foot pressure on this bar stops the lathe instantly by applying the band type brake and automatically cutting out the motor.

Other features of this lathe are:

Motor, mounted on adjustable base, is out of dust area—is easily accessible for maintenance.

Method of mounting offers simplest means of adjusting texrope drive.

Motor starter mounted inside swinging door.

Overhanging head construction is perfectly balanced and allows ample clearance for large pieces.

Self-aligning ball or roller bearing spindle.

Stevens Co.-Mitchell "safety lathe"

Spindle lock through flat-top pulley cover, which may be used as a composition shelf.

Automatic Polishing and Buffing Machine

The Hammond Machinery Builders, Kalamazoo, Mich., announce a new model to their line of automatic polishing and buffing equipment. It will be known as the Type "J" Model "SH."

This machine was designed for a greater range of work than the present "J" models and will carry motors up to 7½ HP capacity. Although primarily designed for rounds up to 6⅝ in. diameter which are held by mechanical fixtures, and flats up to 3 in. x 6 in. held by magnetic chucks, some rounds up to 10⅝ in. diameter and larger and odd shape flats can be handled.

The picture shows heads with wheels on extended motor shafts. With this construction, the spindle speed is limited to the motor speed which on A.C. 60 cycle service is either 1750 or 3500 r.p.m. This machine, however, may be had with Multi-"V" Belt Driven Heads to provide any spindle speed that may be necessary.

The Geneva rotated table has eight revolving spindles which are connected by chain sprocket drives to a ball bearing worm reducing unit. For loading and unloading, however, the three spindles at operator's station cease revolving. The table is driven by a ½ HP motor with "V" Belt Drive having variable pitch sheaves for quick and easy change of table indexing speeds.

Production up to 1800 pieces hourly is possible, depending on the nature of the work. To determine whether parts are adaptable to this machine, it is suggested that one rough and one finished sample be sent to Hammond Machinery Builders, Inc. at Kalamazoo, Mich. There is no obligation and their engineers will report promptly.

Hammond Type J Model SH automatic polishing machine

Respirator

Development of a new type respirator which will prevent silicosis, if worn faithfully, has just been announced from the laboratories of American Optical Company, Southbridge, Mass.

Silicosis, it was explained, is an incurable lung disease caused by breathing silica dust, and the respirator was developed expressly for all industrial workers exposed to the silica dust hazard.

Designed to provide for maximum comfort so that workers will not object to wearing it, the respirator has also been approved by the U. S. Bureau of Mines.

New features reported are: compactness, light weight, unobstructed vision, facial adjustment unnecessary, improved valves with easy inhalation and exhalation, easy to keep in efficient working order, and a more effective filter area than other respirators of a comparable type.

Synthetic White Baking Enamel

The Sherwin-Williams Company, 292 Madison Ave., New York, announces a new line of white baking finishes known as KEM Appliance White Enamels, for which they claim a number of features of interest to manufacturers of appliances, furniture and general utility items.

Leading features of the new products are given as: color stability under baking temperatures higher than usually feasible for white enamels, with tolerance of reasonable variations, assuring a dependable color match in assembled articles. Application of the material is said to be easy, and its exceptional build and opacity make possible a full rich finish of unusual beauty. In service it is said to afford maximum resistance to discoloration under exposure to extremes of light, darkness, humidity, grease and usual chemical reagents. Excellent adhesion and hardness, with high resistance to impact, marring and wear are also indicated.

Sherwin-Williams KEM Appliance White Enamels are offered in both high and intermediate baking types to meet the various requirements.

Imitation Gold Electroplate

Of interest to manufacturers of inexpensive metal articles is the newly developed Goldglo imitation gold plate, which is now being placed on the market by Special Chemicals Corporation, 30 Irving Place, New York City, Dept. M.

Developed to meet the need for a low cost finish that has the appeal of the rich warm beauty of gold, the makers claim that Goldglo's 18 kt. color is rivalled only by actual gold.

Goldglo is recommended for a wide range of products. It is said to have extremely high throwing power, and to penetrate to remote recesses to plate as evenly as on flat, even surfaces. It can be used for basket plating.

It plates directly over brass, copper, nickel, german silver, iron, and steel; also over all hard solders, and a majority of soft solders. Goldglo requires lacquering to insure permanency of the finish.

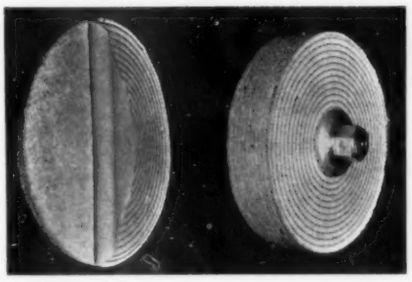
Sisalin Sections

Sisalin sections are a new development of the Hanson-Van Winkle-Munning Company, Matawan, N. J., manufacturers of electroplating and polishing equipment and supplies. Sisal is a tough fibre used in the manufacture of rope and binder twine.

The Sisal used in these sections is in specially prepared mat form. It is interleaved with alternate layers of muslin and the resultant product is then bound together by various types of sewing. The external appearance of a Sisalin section is much the same as a cotton buff section.

The principal use of this product is for intermediate operations between polishing and buffing. It is especially effective in removing the minor imperfections or die marks from the base metal.

Sisalin sections are recommended for carbon steel, stainless steel, brass, copper, and aluminum. The composition to use will vary with the type of metal and finish to be produced. Generally, compounds are limited to tripoli, stainless steel rouge and emery paste. Considerable composition saving can be effected by the use of Sisalin sections as the composition is excellently retained between the strands of the Sisal. When a comparatively high finish is desired compositions of a dry type are used.



Left—Construction of individual Sisalin section. Right—Characteristic Sisalin section.

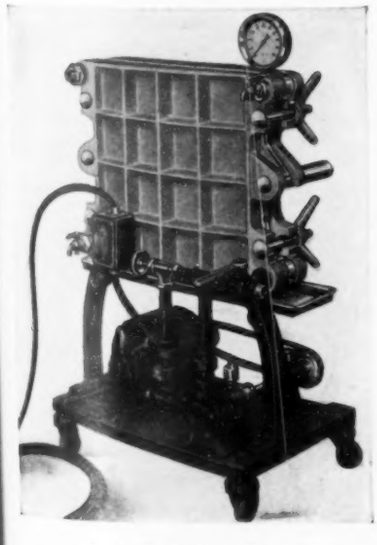
United States Patent No. 2,108,985 on this product was granted to the Hanson-Van Winkle-Munning Company under date of February 22, 1938.

Filter Unit

Announcement of a new filter unit—the Seitz Single-Disc Junior Filter No. 40-1, is made by the American Seitz Filter Corp., 480 Lexington Ave., New York.

The Junior has been simplified so that it can be instantly expanded from a single disc to a multiple unit just by adding filter screens. It is not necessary to make any changes, or to purchase extra parts. The Seitz Junior Filter takes a 16 in. x 16 in. sheet. The flow-rate per filter sheet delivers up to 100 gallons per hour.

An added feature is a special by-pass plate which provides double filtration in this small unit. The filter sheets are divided into two sections, permitting the filtrate from one section to flow into the second section. Therefore, even though this filter is very compact, both rough and polish filtration are accomplished simultaneously.



Seitz single-disc filter

Black Baking Enamels

The release of a new development is announced by The Sherwin-Williams Co., Cleveland, Ohio. A series of 4 Production Black Baking Enamels "A"—"B"—"C"—"D"—is offered for low-cost product finishing which, it is said, sets a new standard for value, performance and service.

Ratings for performance and service have been determined by thorough testing and have been tabulated to show the values developed at baking temperatures of 200°—250°—300°—350°—400° F. Ratings are chartered for gloss, elasticity, adhesion, gasoline resistance, salt spray, bleeding and hardness. This enables the manufacturer to select the enamel and the finishing procedure best suited to the expected service of his product.

Production Enamel "A" is preferred by many large users because it bakes to a rich gloss without being so sharp as to accentuate surface imperfections. Enamel "B" is similar to "A" but with somewhat lower gloss. Enamel "C" can be air-dried or baked and provides the sharpest gloss. Enamel "D" is the dull finish of the group.

The manufacturer states that these enamels are formulated to apply equally well by spray, flock or dip methods and that their wide acceptance for automobile frames is due, in part, to exceptional long, free drain which eliminates runs and sags.

Production Black Enamels are recommended for an extensive field of metal products as diversified as automobile frames and coat hangers, bed springs and building hardware, implements, display racks, camp stoves and steel drums.

Bright Nickel Plating Patents

Of considerable interest to the plating trade is an announcement of the issuance of two recent patents to The McGean Chemical Company, 25 Prospect Ave., N.W., Cleveland, Ohio. These patents relate to bright nickel plating and are U. S. Patent No. 2,112,818 issued March 29, 1938 and U. S. Patent No. 2,114,006 issued April 12, 1938 on applications of Virgil H. Waite.

Mr. Waite is Director of Research for The McGean Chemical Company, which occupies a prominent position in the electroplating industry as manufacturers of anodes and chemicals.

The McGean process of bright nickel plating is said to have been in successful commercial use on a substatnial scale for over three years, particularly on automotive parts.

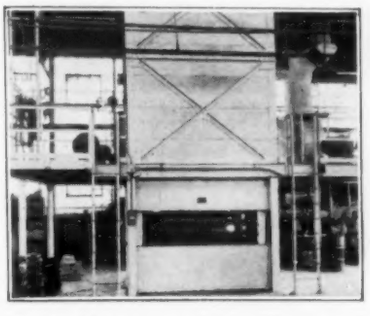
Soldering Flux

A soldering flux called Roslin has been developed by the Saf-T-Flux Company, North Wales, Pa., to supply the demand for a non-corrosive flux with the good qualities of rosin and alcohol but with greater soldering activity. Roslin, it is stated, takes rapidly and at low temperatures on oxidized as well as clean metals such as copper, brass, nickel, cadmium and zinc, leaving a clean hard finish. It will also solder on clean steel without causing rust to form afterward. No smoke or unpleasant odor. Contains no chlorides or other corrosive materials.

Roslin is recommended for soldering instruments, radio parts, etc.

Vertical Core Ovens

An interesting installation of vertical core ovens has been made by the Carl-Mayer Corp., 3030 Euclid Ave., Cleveland, Ohio, in the plant of the Harrison Radiator Corp., (subsidiary of General Motors), Lockport, N. Y. The size of the oven is 10 ft. 2 in. wide x 10 ft. 8 in. deep x 46 ft. high. It is approximately 8 ft. above the working or loading floor line, allowing sufficient head room to work beneath the oven, which is oil fired, using the Air Heater system.



Carl-Mayer vertical core oven

Measuring the Thickness of Coatings

The American Instrument Company of Silver Spring, Md., announces the Aminco-Brenner Magne-Gage, an instrument for measuring the thicknesses of coatings on metals.

This instrument, developed at the National Bureau of Standards, is a magnetic spring balance by means of which the force of attraction of a small permanent magnet to any surface (plane, convex, or concave) is indicated on the graduated dial of the instrument. The thicknesses corresponding to the dial readings are determined by calibration curves supplied with the instrument.

The Magne-Gage has three distinctive applications in measuring coating thickness i.e.

(1) Nickel coatings on non-magnetic base metals (brass, copper, zinc, etc.);

(2) Non-magnetic coatings on magnetic base metals; coatings may be metallic (copper, zinc, cadmium, tin, lead, and chromium), or non-metallic (paint, varnish, lacquer, vitreous enamel, etc.); base metal may be iron or steel;

(3) Nickel coatings on iron and steel.

The same type of instrument is used for all three applications except for the size of the magnet and the strength of the spring.

Calibration is done by the National Bureau of Standards whose calibration curves are supplied with each instrument.

Principles of the Method

The measurement of the thickness of coatings on metals by the magnetic method is based on the following principles.

(1) That the force of attraction between a permanent bar magnet and a nickel coating on a non-magnetic base metal is practically proportional to the thickness of the coating, consequently if a magnet is calibrated with nickel coatings of known thicknesses, it serves to measure coatings of other thicknesses. The force of attraction, which is measured by the torsion of a spiral spring, is indicated on the dial, and the dial readings are converted into thickness measurements by reference to a calibration chart.

(2) That any non-magnetic material such as zinc, copper, enamel, paint, etc. placed between the magnet and a magnetic base metal such as iron or steel, decreases the magnetic attraction to an extent that depends upon the thickness of the intervening layer. Therefore, if a permanent bar magnet is calibrated with non-metallic coatings of known thicknesses on iron or steel, it can be used to determine the thickness of other non-magnetic coatings.

(3) That a nickel coating over a base of steel exerts only about one-half as much attraction as does the steel, and that this attraction is proportional to the thickness of the coating.

Accuracy of the Method

Nickel Coatings on Non-magnetic Base Metals. The magnetic method for measuring local thickness of coatings has been checked painstakingly against metallographic measurements and was found to be accurate within ±10%.

Measurements were made also on about 50 commercially plated plumbing fittings, on each of which the average coating thickness by magnetic measurement was compared with the average thickness obtained by stripping and analyzing the coatings. The two methods agreed within ±15%.

The results of these tests show that the magnetic method is accurate enough for most testing purposes.

Non-magnetic Coatings on Magnetic Base Metals. The thickness of copper, nickel, cadmium, zinc, tin, paint, and vitreous enamel coatings on about 50 commercial articles were measured magnetically and the results were checked either with a microscope or by stripping. Some coatings were measured both before and after burnishing.

Aminco-Brenner Magne-Gage

In nearly all cases the burnishing gave more accurate results in addition to improving the reproducibility of the readings.

The average error of the magnetic method was found to be about ±10% for coatings thicker than 0.0002 in.

Measurements on good quality electro-deposited coatings and on smooth painted or enameled surfaces are generally satisfactory.

Measurements on galvanized sheet were about 10% low, perhaps because of the presence of zinc-iron alloys.

Results on tin plate were about 25% low, but all the coatings tested were very thin (about 0.0001 in. thick). If measurements on tin plate are consistently low, an appropriate curve can be based on calibration with similar coatings.

Simple Procedure in Making Thickness Measurements

In making thickness measurements with the Magna-Gage, the end of the magnet is brought into contact with the coating, and the dial is turned until the magnet is detached from the coating. The first reading is approximate, therefore several readings should be taken and averaged.

The dial readings are converted to thickness by means of a calibration curve supplied with the instrument, or the dial may be graduated to read thicknesses directly.

Non-Destructive

The magnetic method of measuring coating thickness is non-destructive. It does not harm the coating or the base metal. This is in marked contrast to the metallographic method (which is comparatively slow and requires expensive equipment and skill), the stripping method, the dropping method, the chord method, and the jet method, all of which have a common failing, in that they destroy the coating which they test.

Especially Advantageous for Works Control or Acceptance Testing

Since the magnetic method is non-destructive, rapid, and requires little experience for its use, it finds ready application by both makers and buyers of coated articles.

Tests may be applied readily and non-destructively to all or part of the production of a plant, or of deliveries, and the method assures the plater that his product meets specifications, thereby eliminating costly rejections.

For works control, the method may be used also in a plant for the purpose of studying the distribution of nickel upon articles plated under definite conditions, and thus lead to the design of tanks, conveyors, racks, anodes, etc. that yield the most uniform distribution of nickel or other coatings.

In acceptance testing it is of value in that it readily reveals to the purchaser whether or not the thickness of plating is in accordance with the specifications.

Line of Cleaning Materials

"A cleaner for every purpose"—is made by the Apex Alkali Products Company, Upper Darby, Pa. This line embraces the following compounds:

Apex A is completely water-soluble containing no fillers. It contains an incorporated wetting agent; not injurious to the skin; advocated for use on material to be electroplated and for the removal of cutting or slushing oils and greases; also for cleaning off, drawing and cutting compounds from materials to be enameled or painted.

Apex B is a "heavy duty" cleaner for use on iron and steel only, for the removal of the thickest oils from heavy castings and caked-on dirt and grease from large draw press work; compound 100% soluble; no fillers.

Apex M is recommended for cleaning brass and copper, removing animal or vegetable oils; leaves no white alkaline deposit; non-poisonous, non-caking, free-rinsing.

Apex O is recommended for cleaning aluminum, zinc, cadmium, brass, copper and other non-ferrous metals; instantly soluble with a prolonged pH or active cleaning value.

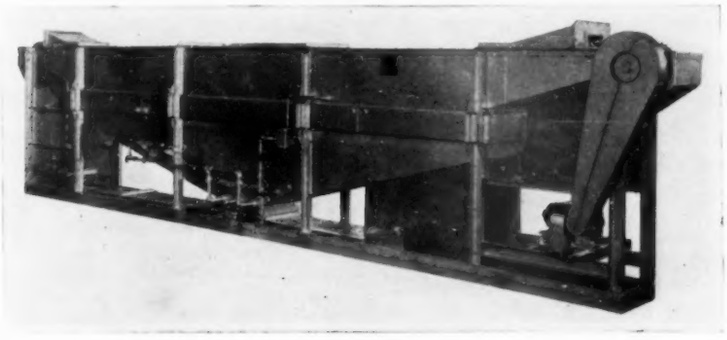
Apex R is water-soluble, containing an emulsifier for swiftly removing oils and greases; recommended for heavy work covered with sulphur-base oils; also animal and vegetable oils; recommended *only* for ferrous metals.

Apex RS is recommended for general plating room work, brass, copper or lead. Apex T10 is suitable for tin plated metal ware, and all non-ferrous metals.

One-Dip Degreaser

The completely automatic degreasing machine illustrated—designated as a special one-dip, Model 1-DC-700 Detrex Degreaser—has been manufactured by the Detroit Rex Products Company, 13005 MI, Hillview Ave., Detroit, Mich., especially for cleaning small, intricate-shaped radio tube parts prior to inspection and assembly.

This unit is designed for loading and unloading at opposite ends. The conveyor is similar to a continuous belt type conveyor, consisting of a series of closely spaced cross-rods. It returns beneath the machine to the loading station.



Detroit Rex special one-dip degreaser

Work is handled in small, perforated-bottom trays which are semi-automatically fed onto the conveying belt. These trays are then lowered through the vapor zone where the work is thoroughly wetted by hot solvent vapors condensing on the cool metal parts. As the work progresses through the degreaser, it is immersed in boiling solvent, insuring complete removal of oil and grease and any solid particles which may have adhered to the surface of the parts. Drying is effected by again bringing the work up through the vapor zone to the unloading station. The work emerges from the degreaser clean, warm, and dry—ready for inspection and assembly. The entire cycle of cleaning operations is accomplished in less than three minutes.

A water jacket condenser and a solvent collecting trough completely encircle the machine. The solvent vapors, which condense at the level of the water jacket, collect in the trough and are returned to the boiling sump by means of a solvent run-back line containing a solvent vapor trap and a water separator.

This degreaser is equipped with a Model S-50 Detrex solvent still for reclaiming contaminated solvent. The still is capable of distilling the entire solvent content of the machine in approximately one hour. This insures an immediately available supply of clean solvent distillate for operating purposes.

At a normal conveyor speed of 7 feet per minute, the rated production capacity of this unit (with single line of trays) is 720 trays per hour, each tray containing approximately 24 pieces of work.

The approximate overall dimensions of the degreaser are: length, 27 ft. 7 in., width, 3 ft., height, 6 ft. 2 in.

Spray Gun

A new spray gun, known as the Eclipse "Gat," has been announced by Eclipse Air Brush Company, 390 Park Ave., Newark, N. J. The "Gat" embodies the power pressure operating principle.

The "Gat," weighing only 23 ounces complete, is manufactured of heat treated Dowmetal, one-third lighter than aluminum, yet having the tensile strength of brass. It can be operated with either internal or external atomization.

Eclipse "Gat"

Nozzles are available for all purposes and materials. Widths of spray vary from 1 in. to 36 in., depending on requirements. Excellent results are said to have been obtained with nitro-cellulose and synthetic lacquers, as well as with paints, varnishes and enamels.

Air Line Respirator

Complete protection against welding and cutting fumes, paint spray vapors and pigments, fumes from molten or burning metals and toxic dusts, is said to be provided by the new MSA air line respirator, recently developed and placed on the market by the Mine Safety Appliances Company, Braddock, Thomas and Meade Streets, Pittsburgh, Pennsylvania.

Its U. S. Navy Half Mask type face-piece is all rubber, easily adjusted and fits any face with a gas-tight seal. Incoming air is deflected from directly striking the face, and the exhalation valve meets strict U. S. Government specifications. A corrugated, non-collapsible all-rubber connecting tube extends from face-piece to flow control valve at the belt; it is flexible, durable and permits free head movement. A "bump-proof" handle and quick-release connection on the flow-control valve provides added safety.

An illustrated bulletin describing the MSA Air Line Respirator is available either by writing this magazine or by addressing the manufacturer direct.

Chemical Products

Charles H. Proctor, who is nationally known as one of the pioneers of the electroplating industry, is now president and treasurer of the Proctor Chemical Co., Clearwater, Fla. Among the products of his company is "Kloric" for removing rust streaks and heavy, stubborn stains from metals and metal products. The company also manufactures a line of household cleaners, insecticides and liniments for sunburn, etc.

High Speed Grinder

To profit as a result of the economies effected in the use of high speed wheels, first, it is imperative that an efficient surface speed is maintained regardless of wheel size; second, wheels can be used right down to the wheel flanges, making it necessary to throw away only a small unusable stub; third, changing speeds is effected quickly and there is no chance to overspeed wheels; fourth, grinders must be built to withstand the vibrations and extra-heavy strain put on them as a result of the higher speeds.

The new Hammond "Multi-Hi Speed" grinder, it is stated, has been engineered and designed not only to meet these exacting conditions but it incorporates many additional features contributing to lower grinding costs. A few of its features are:

A—Any speed may be had—two, three, four, or infinite.

B—Only a minute is required to change speeds.

C—Overspeed proof—insuring protection to operator as wheels cannot be overspeeded.

D—It is unnecessary to disturb the main spindle or bearings when replacing belts.

E—It will handle wheels from 18 in. to 30 in. diameter and any motor from 10 HP to 25 HP.

While this grinder was designed primarily for high speed wheels, it is said to be equally suitable for vitrified wheels. Full information is obtainable from the Hammond Machinery Builders of Kalamazoo, Mich.

Hammond "Multi-Hi Speed" grinder

Respirators

The Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn, N. Y., announces the following series of new respirators of value in metal finishing plants.

Double cartridge chemical respirator. By utilizing two chemical cartridges instead of one, this new DC-1400 respirator provides greater protection for twice the period against organic, acid and amyl acetate fumes and spray painting mists. It is light, comfortable to wear and permits easy, natural breathing. Cartridges need changing less often. Has an all-aluminum body; patented rubber face cushion; positive exhaust valve; all-rubber headbands. Goggles may be worn without interference.

Improved one-cartridge respirator. By the addition of an outer felt dust filter, the chemical cartridge is protected against clogging by particles in vapors or spray mists. Cartridges thus give longer service. Has the other construction features shown above. Listed as model R-151.

Duo-filter dust respirator. Has two felt filter discs which increase efficiency and lower breathing resistance against Type "A" dusts. Officially approved by the U. S. Bureau of Mines. Light and comfortable. Easily cleaned, parts replaceable. Has the other construction features shown above. Listed as model D-4100.

Respirator-hoods. Both the double-cartridge chemical respirator and duo-filter dust respirator described above, are available in combination with special hood to protect nose, throat, lungs, eyes, face and head against fumes and dusts. For chemical and acid fumes and spray painting, use model DC-4100 hood, which is constructed of acid-proof material. For dusts, use model DH-4100 hood, made of light, durable, dust proof material. Both hoods have 3-inch eyepieces for unobstructed vision.

Pulmosan double cartridge chemical respirator

Line of Arc Welders

"1,000 Available Combinations of Voltage and Welding Current" is the keynote of announcements of a new line of "Multi-Range" Arc Welders by The Hobart Brothers Company, Troy, Ohio. It is pointed out that the new models embody the same proven principles of control as previous models but that the wide welding range of each machine is now divided into ten ranges with a 100-step, continuously wound rheostat (volt-amp adjuster) operating in each range.

The result is said to be a complete absence of "dead spots," closer control of the relationship between open circuit voltage and welding current—and smoothness of operation. Oscillograph tests and reports from operators also indicate improved stabilization as a result of the special windings, extra turns and added copper which provide reactance of just the right degree for each of the ten welding ranges. The reactance may thus be said to be "automatically varied to suit actual welding requirements."

Hobart "Multi-Range" Arc Welders are now available in "Junior" Models with built in electric motors in 100 and 150 ampere ratings or with self-starting gasoline engine in 200 ampere rating. "Senior" Models include 150, 200, 300, 400 and 600 amperes electric drive, 200, 300, 400, and 600 ampere gasoline engine drive and 200, 300 and 400 amperes generators only for connection to customer's own gasoline engine or electric motor.

Hobart "Multi-Range" arc welder

Tinning and Soldering Flux

Blitzstone, a product of the American Solder & Flux Co., Wayne Ave. and Berkley St., Philadelphia, Pa., is a flux in liquid form with a gravity of approximately 50° Baume. It can be used as a dipping flux as well as a top cover for the surface of the tin bath. The manufacturers state that it gives brighter, smoother and more uniformly tinned surfaces, eliminating to a considerable extent the costly re-dipping operation. It can be used for hand or machine soldering and may be reduced with water or alcohol from 1 to 3 parts depending upon the type of metal to be soldered, speed of operation, etc.

All-Purpose Electric Soldering Unit

A new all-purpose "Deluxe" Thermo-Grip soldering unit for all types of soft soldering work has recently been introduced by the Ideal Commutator Dresser Company, 1941 Park Avenue, Sycamore, Illinois. Operating electrically, the unit eliminates the necessity of using an open flame.

The complete soldering unit consists of a transformer and four heads or tools. Simply plug into any A.C. supply and it is ready for use immediately. All current carrying parts are fully insulated.

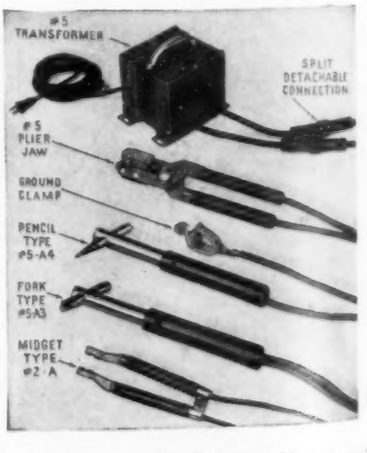
A "Midget" Type Head is especially adaptable for small and lighter soldering and for use in restricted spaces. It is designed for soldering small terminals and lugs up to 150 amp. size, or sweating threadless copper tubing and fittings up to ⅜" diameter.

For more common soldering work the "Standard" Type Head is recommended. It is designed for applying and removing soldering lugs and terminals up to 400 amp. size, up to 1" copper pipes and fittings, making stator connections, heating solder cups, etc.

The "Fork" Type Head is handy for heating small lugs, terminals and connections where it would be impossible to reach with other tools.

The "Pencil" Type Head is adaptable for soldering seamed joints, spot soldering, and for getting into "tight" places. This head is a single-pointed, round carbon rod and is used in the same manner as a welding rod.

On soldering jobs where speed is particularly necessary, a new foot-operated switch is available. This may be used with all "Thermo-Grip" Tools. Releasing the foot pedal cuts current off automatically, leaving both hands free for handling the tool and to work.



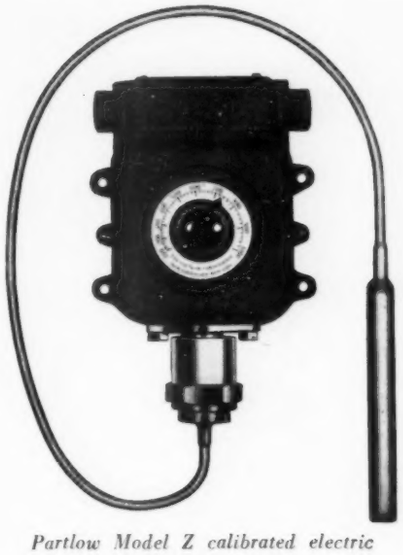
Ideal "all-purpose" electric soldering unit

Electric Temperature Control

A new Model Z electric temperature control, manufactured by Partlow Corp., 2 Campion Rd., New Hartford, N. Y., is described in their bulletins No. 505-I and No. 505-J.

This control is made in both calibrated and uncalibrated models with three temperature ranges of 350°, 650° and 1000° F., regularly supplied with a thermostatic element having a capillary length of 5 ft. Longer lengths can be furnished on request.

The control is especially recommended for baking ovens, air heaters, soft metal melting pots and similar devices, heated by oil, gas or electricity. It has a micro-switch with either normally closed, normally open or single pole-double throw contacts. The double ended conduit connection on the top facilitates the electric wiring, and the entire cover (front and sides) may be removed for inspection without disturbing the temperature setting or wiring. All elements are interchangeable.



Partlow Model Z calibrated electric temperature control

Enameling Oven Installation

An installation of enameling ovens made by the Despatch Oven Co., 622 Ninth St., S.E., Minneapolis, Minn., in the new plant of the Crosley Radio Corporation, Richmond, Ind., is pointed out as one of the most modern and up-to-date in operation. Each refrigerator part is uniformly and properly baked because the temperature within the three Despatch ovens is maintained throughout their interior at plus or minus 4° F. This uniformity is achieved by special heating, air distributing, air circulating, re-circulating and temperature controlling systems. Flexibility of operation permits the use of varying temperatures to follow the recommendations of the paint or finish manufacturers whose materials are being used.

Heat losses are cut by the use of special "Non-Thru" metal panels, sealed entrances and exits, heavily insulated exterior duct work, etc.

The entire job weighs close to 400,000 pounds, or 200 tons. These three ovens have a total interior volume of over 76,000 cu. ft.

The heating systems were carefully sized. Two Surface Combustion heaters on each prime oven with a total of 2,000,000 BTU per hour permit the processing of a 9250 pound gross load per hour or 50 boxes per hour per oven at 450° F. with a baking time of 45 minutes. Four Ross Harrison heaters on each compartment of the finish coat oven with a total output of 4,000,000 BTU per hour permit the processing of a 9250 pound gross load per hour per compartment at 350° F., with a baking time of 60 minutes.

The refrigerator parts are hung on special carriers; two carriers for one refrigerator box. After the parts are placed on the conveyor, they go through the spray booth for a prime coat, then through the prime coat oven, then out for sanding; then to the spray booth for finish coat, then through the finish coat oven and out for unloading and assembling.

Baking refrigerator part finishes in Despatch ovens

High Temperature Equipment

Announcement has just been made by the Armstrong Cork Products Company of Lancaster, Pa., of two new products—Coprtex High Temperature Block and Coprtex Heat Insulating Cement for service in high temperature equipment.

Both products, according to the manufacturer, have performed unusually well in a long series of rigid tests in the Armstrong Central Technical Laboratory and in actual installations.

Features of Coprtex Block are a high temperature limit of 1800° F.; low lineal shrinkage; superior insulating efficiency; high modulus of rupture; accommodation of rivet heads and similar projections; lightness in weight; and availability in special as well as standard shapes. The manufacturer recommends Coprtex Cement for its high temperature limit; low lineal shrinkage; superior insulating efficiency, etc.

Tungsten Electroplating

The certified formulations of the Tunxten Dry Concentrates fundamental for the successful operation of the Tungsten electrodeposit processes are the result of research and development by the Tungsten Electrodeposit Corporation, Barr Bldg., Washington, D. C., in cooperation with the Grasselli Chemical Laboratories and a license agreement has been accomplished by E. I. du-Pont de Nemours and Company, Inc., Wilmington, Dela., for the production, sale and distribution of these Tunxten Dry Concentrates to the licensees of this corporation.

Parting Compound

In keeping with the practice of minimizing uneven cooling in large metal castings with chillers, it is advantageous to coat the rod or core implements with materials that contribute to heat transfer and facilitate easy removal from the cooling castings. Of suitable compounds tested for this purpose, the films formed with colloidal graphite in aqueous suspension are particularly useful, it is stated by the Acheson Colloids Corp., Port Huron, Mich.

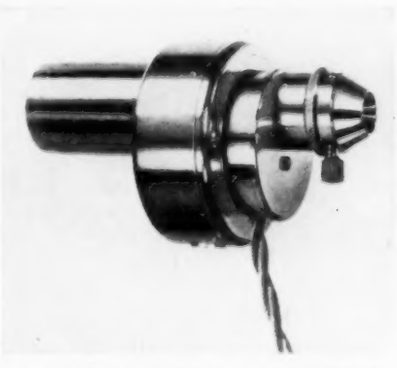
For foundry use, cooling rods or chillers are painted with an agglomerate-free dispersion of colloidal graphite in water. While generally a one-to-one solution is adequate, the concentration of graphite may be varied to meet operating conditions. The inert and unctuous layer thus formed provides both the desired parting and chilling action.

Radiation Pyrometer

A new radiation pyrometer which uses as a temperature-sensitive unit, the Ardometer, shown in the illustration, is being offered by The Bristol Company, Waterbury, Conn.

This instrument measures the surface temperature of hot objects or masses above 1000° F., when the Ardometer unit is sighted so that it picks up the heat rays emitted. The temperature is recorded on one of Bristol's potentiometers—on a round- or strip-chart recorder—or is indicated on a millivoltmeter pyrometer.

The Ardometer has the feature that it can be sighted directly on the object in the furnace and in this position it measures instantly the temperature of the object itself. It follows the temperature changes in the material on which it is sighted.



Bristol Ardometer radiation pyrometer

Spectacle Goggle

A new type spectacle goggle, equipped with "Super-Tough" lenses and designated as Style WVI, has just been added to the line of more than three hundred goggles now manufactured by Willson Products, Inc., 267 Thorn Street, Reading, Pa.

Designed for maximum protection and comfort, this new goggle is available in various assemblies to suit the individual requirements of the wearer and is particularly applicable for use in industries where falling or flying objects present a serious eye hazard.

The illustration shows the goggle equipped with clear, wide-view lenses and rocker nose pads; it is also made with comfortable broad saddle nose bridge. The goggles are available with wire screen, leather or transparent sonite sideshields, and with Willsonite lenses when specified.

Willson spectacle goggles

Respirator for Lead and Type A Dusts

The Chicago Eye Shield Co., 2300 Warren Boulevard, Chicago, Ill., is offering a new style respirator for use in the lead dust generating trades such as: storage battery manufacture, enameling, etc.; and for protection against Type A dusts, as: quartz, cement, coke, aluminum, etc. The filter units are said to function with equal efficiency in the presence of either hazard. They are of unique construction, exclusive with this company.

The face cushions are anatomically shaped, conform to facial contours, and seal tightly without perceptible pressure because they have soft turned facial contact edges. These impart a "lamb's wool" feel to the face.

Unusually large breathing area (45 square inches) has been attained without any excessive increase in bulk. The weight has been kept to the irreducible minimum.

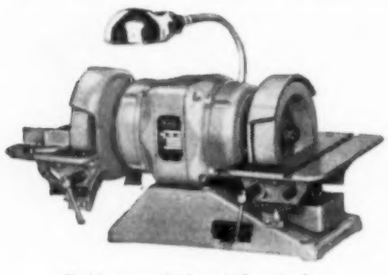
The headband is a special type exclusive with this manufacturer. It is made of moulded pure gum rubber, and claim is made it will outlast the ordinary kind ten to one. It has been approved by the U. S. Bureau of Mines for Lead and Type A dusts.

Chicago respirator for lead dusts

Carbide Tool Grinder

The Baldor Electric Co., 4351 Duncan Ave., St. Louis, Mo., announces several changes in the construction of its carbide tool grinder. Standard equipment now includes a protector type tool support which indicates the angle at which the tool is being ground.

The tool rest tables are now adjustable so that they may be moved toward the wheel, thus providing for wheel wear. The grinder can be supplied with a diamond wheel dresser especially adapted. Bulletin No. 58, available on request, contains a complete description.



Baldor carbide tool grinder

New Line of Electrodes

A complete line of shielded-arc welding electrodes—claimed by the manufacturer to be quieter in operation, faster in welding time, produce finer bead appearance, and have greater adaptability per rod—is offered by The McKay Company, Pittsburgh, Pa.

The makers state that, while the new electrodes are of an improved type, no changes in customary operating practice are required.

In accounting for their ability to produce a line of "precision" electrodes of higher efficiency, the company gives three reasons:

(1) A new plant at York, Pa., equipped with newly designed machinery.

(2) Scientific developments of the electrodes by a group of factory experts.

(3) Supplemental work of an outstanding, independent research organization.

A folder describing the line of electrodes may be obtained on request.

New Information Bureau

Initial plans have been completed for the establishment of a huge technical and commercial information bureau where executives, engineers, designers, production managers, writers and others may procure without cost technical data and literature on materials, products and processes, as well as technical consultation service. The Bureau will be located in International Building, New York City, and is being sponsored by Designers for Industry, Inc., through its Chicago, Cleveland and New York offices. An initial ten-thousand drawer filing system is contemplated from which trade literature will be distributed to persons interested. The Bureau will be manned by a corps of consultant specialists representing the eight major divisions of industry.

Portable Potentiometer

The Wheelco Instruments Company, 1933 South Halsted St., Chicago, Ill., offers a new portable potentiometer specially designed and built for use in field or laboratory service.

This precision instrument is built in three different models: Model 310, with cold junction compensator; Model 320, with cold junction compensator and run-up box; Model 330, with cold junction compensator, run-up box, and standard thermocouple line compensating rheostat.

When used with thermocouples, this unit becomes a checking instrument, whose accuracy and sensitivity is far higher than any direct reading pyrometer.

Scales are obtainable calibrated in millivolts or in degrees F. or C., or both.

Wheelco portable potentiometer

1% NICKEL *made 'em...*

FOUNDRY FOREMAN quit cussing when 1% Nickel increased fluidity and promoted better casting qualities from heat to heat.

BOSS started smiling when rejects stopped eating profits – no foundryman ever gets rich on rejects. Nickel added to bronze assures pressure tightness, increases tensile and compression strength, adds hardness with little or no loss in ductility; simplifies machining.

CUSTOMER relaxed when these Nickel bronze castings for locomotive boiler feed pumps withstood required pressure tests—and were sound and dense throughout.

CONSULTING ENGINEER beamed when finished Nickel bronze castings held pressures and, despite high temperatures, "proved satisfactory in every way."

PRESSURE-TIGHT CASTINGS

These locomotive boiler feed pump castings were produced of a Nickel bronze composition:

COPPER	85%
ZINC	5%
LEAD	5%
TIN	4%
NICKEL	1%

Castings by Textile Machine Co., Reading, Pa., for J. S. Coffin Jr. Co., Englewood, N. J. E. L. Schellans, Consulting Engineer.

CAST
NICKEL
BRONZES

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

Rust Inhibitor

Denso-Tech is the trade name of a rust inhibitor made by the Densol Paint Co., Box 34, South Park, Ohio. It is not a lacquer or a varnish but a formulation of specially selected synthetic materials to produce a clear (practically water white) rapid drying coating; thin, uniform, exceedingly tough, flexible and transparent. It is said to have high rust preventive qualities and to stand bending, twisting or drawing without fracturing or affecting the adhesion. It is electrically positive and said to be rated exceptionally high as to dielectric resistance and insulation value. It can be brushed, sprayed or dipped. Air dries at ordinary temperatures in 10 to 15 minutes and in lesser time when reduced. Can be baked to meet a wide variety of schedules; from 1 hour at 150° F., to 10 min. at 350° F.

Denso-Tech is also recommended as a rust preventive priming coat for use under any type of finish.

Where used under oil or synthetic finishes one-half hour air dry is ample. Where used under lacquers a bake of one-half hour at 225° F. to 275° F. is recommended or 36 hours air dry if baking is not feasible.

Correspondence Courses in Electroplating Approved

The correspondence courses offered by Dr. C. B. F. Young have recently been approved by the Educational Department of the State of New York. The Certificate of Approval, No. 116, was issued after the proper authorities had thoroughly investigated the cost, method of payment, and material presented in the study.

Prior to the issuance of this Certificate of Approval by the State, these courses were also investigated by the New York City branch of the American Electro-Platers' Society. A committee was appointed to check the material offered, cost, etc. and report to the Branch. The committee reported in favor of approval and the branch approved unanimously.

The course is divided into two parts. Part I deals with the fundamentals of chemistry as applied to electroplating, while Part II takes up the theory and practice of electroplating. Both courses consist of lectures and laboratory lessons. A complete laboratory kit is supplied with each course.

For further information write Dr. C. B. F. Young, Box 292, Flushing, N. Y.

Watch for Coming Issues of Metal Industry!

Our June issue, as always, will be primarily a plating issue. First and foremost will be the Pre-Convention, advance information article about the Annual Convention of the American Electro-Platers' Society, to be held in Milwaukee, Wisc., June 13-16. Program, entertainment, plant visits—all the information required will be found in this article.

But technique and shop practice will not be neglected. At this time the following new articles are on our list, waiting to be published.

The Electrodeposition of Metals from Non-Aqueous Solutions, by Thedford P. Dirkse and H. T. Briscoe of the Department of Chemistry, Indiana University.

The Modern Electrotype Industry. Reproduction by electrodeposition as practiced in two up-to-date plants in New York.

And many others which lack of space prevents us from listing.

Watch for Coming Issues of Metal Industry!

What the Reader Says

Zinc Fumes in the Foundry

Editor, METAL INDUSTRY:

Some time ago we wrote you in reference to the trouble we were having with gas from our brass foundry. Our molder is especially susceptible to this and it got so bad that we had to do something or he would not be able to operate the foundry. We received suggestions from you and

also some other literature, which we followed carefully.

We found, however, that no amount of ventilation or fans would solve problems as the operator was sure to get the gas when pouring the molds. We, therefore, got to work on an idea of our own and it has proved to be 100% effective.

We first enclosed the furnace with cement block, making a room about 6′ x 8′ and on the edge of this we made a stack 28″ x 36′ and covered the enclosure around the furnace as tightly as possible, over the top, with galvanized sheet iron, leaving a small enclosure for filling and operating the crucible. We then made a turntable of sufficient diameter to hold the flasks we needed so placed that they would come under the extension coming from the enclosed space around the furnace. The crucible would then be raised into this extension so that it would be directly over the flasks to be poured. The operator stands near the center of the turntable. An assistant would then turn the table to bring the flasks in the proper position. The pouring could be done much more rapidly and accurately than any other way and the indraft into the enclosure was such that not a particle of the gases came outside, either in the pouring or the operating of the furnace. We find this idea works out perfectly, making it easier to handle the flasks and to pour them. It has overcome absolutely any trouble we have had from the zinc oxide.

We are wondering if any of your readers have ever tried out an idea of this kind. We believe it would be practical for large foundries as well as the small ones. It could be made up to take care of two or more furnaces and the turntables could be made any diameter needed. We might add that this turntable is set in a 5″ pipe, buried in cement, with babbitted bearings on the 4″ that works inside of the 5″. The 5″ then is filled with oil, and works very easily and can be operated even by a small boy when it is fully loaded with the flasks.

Newfield, N. J.

C. W. Skinner & Co.

We read your letter with a great deal of interest and your plan looks very practical and is along the line we suggested, that is, large stack to carry off the fumes. However, you have gone much further and your plan looks 100%; worth considering by anyone troubled with gas in their foundry.

—W. J. R.

New Books

Casting Manual for Non-Ferrous Metals, by Sam Tour. Size 5¼ x 7½; 52 pages. Published by Metal Industry Publishing Co., 116 John St., New York. Free to subscribers of Metal Industry.

The 1938 edition of this pocket manual, which has made a name for itself throughout the brass foundry industry, has been completely rewritten, revised and brought up-to-date. The author is nationally known as a consulting metallurgist especially in brass foundry work. In this edition he concentrates on the sand cast copper and copper base alloys, including information on the properties of all of the commercially important alloys of copper: leaded red brass, leaded semi-red brass, yellow brass, high tensile yellow brass, white brass, tin bronze, leaded tin bronze, lead bronze, aluminum bronze, silicon bronze and beryllium bronze. In addition, considerable space is devoted to brass foundry practice: melting, pouring, gating, molding, shaking out and cleaning. Equipment, supplies and accessories are extensively discussed, with data on refractories, crucibles and sands. Especially interesting and original sections are devoted to (1) defects in castings and their probable causes, and (2) a chart of 16 types of gates used in brass foundry work. The booklet is an invaluable handy foundry aid.

All subscribers to Metal Industry who are interested in this type of work and who have not yet received their copy, are requested to write at once, on company stationery.

Chemical Analysis of Metals and Alloys, by Edwin Gregory and Walter W. Stevenson. Published by Chemical Publishing Co. of N. Y., Inc. Size 6 x 9; 375 pages. Price $6.00.

A text book of analytical chemistry of metals, divided into three main groups: Chemical Principles and Methods Important for Analysis; Chemistry of the Elements Which May Exist in Alloys; Detailed Methods of Analysis.

The metals discussed are iron and steel, ferro-alloys, non-ferrous metals, ores and slags.

Newer Methods of Volumetric Chemical Analysis, by Erna Brennecke, Fresenius Chemical Laboratory, Wiesbaden; N. Howell Furman, Princeton University; Hellmuth Stamm, University of Halle; Rudolf Lang, Technical School, Brunn; and Kasimir Fajans, University of Michigan. Wilhelm Bottger, editor. Translated by Ralph E.

Oesper, associate Professor of Analytical Chemistry, University of Cincinnati. Published by D. Van Nostrand Co., New York. Size 6 x 9; 268 pages. Price $3.75.

A translation of a German symposium whose object was bringing up to date a branch of quantitative chemistry in which great progress has been made during the past two decades.

Headings of main divisions are as follows: Elimination of the Titration Error in Acidimetric and Alkalimetric Titrations; Ceric Sulfate as a Volumetric Oxidizing Agent; Alkaline Permanganate Solution as Volumetric Oxidizing Agent; Iodate and Bromate Methods, including Manchot's Bromometric Method; Chromous Solutions as Volumetric Reducing Agents; Oxidation-Reduction Indicators; Adsorption Indicators for Precipitation Titrations.

Aluminum Paint and Powder, 2nd edition, by Junius D. Edwards. Published by Reinhold Publishing Corp., 216 pages. Price $4.50.

The second edition of this book (which has appeared nine years after the first) finds the industry so greatly changed and expanded that the book is practically new, being much larger and covering much more ground. The subject of aluminum paint for metals is, of course, of the greatest interest to readers of this journal, but other chapters are valuable, including those on the use of aluminum powder and the processes for making the powder.

The author is too well known as an authority in the aluminum industry to need an introduction. This work is a thorough job, keeping in print the technique of an industry which is making rapid strides forward.

Blue Book of the National Association of Waste Material Dealers, Times Bldg., New York. Size 7½ x 10½; 407 pages. Price $5.00.

The 25th anniversary volume of this organization. The Blue Book is a reference work on the waste material industry, giving all classifications, specifications and trade customs and a special section with information for those engaged in foreign trade; also data on transportation and a statistical section covering the last 25 years with marked changes and import and export figures.

Graphic Routes to Greater Profits, by John W. Esterline. Size 8½ x 11; 320 pages, 450 illustrations. Published by the Esterline-Angus Co., Indianapolis, Ind.

The book describes the use of graphic instruments for increasing the productive capacity and efficiency of industry. It gives more than 250 case studies, each covering a distinct problem to procedure followed, the graphic charts obtained and the solution reached.

Contents are divided into an introductory section and five additional divisions: "The Problems of Power"; "The Problems of Machines"; "The Problems of Processes"; "The Problems of Men"; "Research and Special Problems."

Metal Statistics 1938 *Edition.* Edited by B. E. V. Luty and N. J. Langer. Published by American Metal Market, 111 John St., New York City. Size 6 x 4; over 600 pages. Price $2.00.

The 31st annual edition of this well known statistical reference book on metals. Data on production, consumption, imports, exports, stocks, price fluctuations and averages, monthly and annually.

Advertising and Selling Through Business Publications, by Mabel Potter Hanford. Published by Harper Bros., New York. Price $2.50.

"There was a time not so many years ago when business papers were the stepchildren of advertising," says *Roy S. Durstine* in his foreword. "One of the basic difficulties was that it was so hard to distinguish between good ones and those which were only barnacles on their industries. . . . But this much is true—the business paper publishers and the advertisers have been coming closer and closer together for the welfare of the advertiser. And the vitality and effectiveness of good business papers are so necessary to the advertisers' interests that somehow a solution will be found. So everyone concerned will welcome a book seriously intended to acquaint a wider circle with business papers."

As business publications have progressed and publishers have recognized the values of audited circulation statements, the space buyer's task of determining just which of a number of strong publications will do his job most thoroughly, has become increasingly complex. The searching analysis to which circulation reports are put today is revealed in the chapter on "Circulation Methods and the Audit Bureaus."

The editorial story and the responsibility of the man who occupies the editorial chair to his reader and to the advertiser, receives considerable attention in the chapter on "Editorial Standards." Mrs. Hanford lists 25 questions which the advertiser and space buyer might well ask the space salesman about the editor of his publication. Does the editor ever go out among his advertisers and discuss their peculiar problems with them? Has the editor the ability to foresee

industrial and merchandising trends and what is he doing, editorially, to prepare the market for the reception of new ideas and the acceptance of new movements? Even if the readers do not always agree with the editor, do they respect his integrity and purposefulness and accord him following because of this respect?

Included in the book is a comprehensive bibliography of sources of market statistics, together with the findings of a far-reaching survey of reader habits conducted by Crossley, Inc., for the McGraw Hill Co. in 1937, and here published for the first time.

"*Advertising and Selling Through Business Publications*" is a pioneer book in this particular field of advertising effort and publishing. It was planned as a text book of value to publishers, advertisers and students interested in this type of media and concerned with establishing business paper advertising and publishing on a sound and effective basis.

Government Publications

Rolled Zinc in 1937—Advance Summary. U. S. Bureau of Mines, Washington, D. C.

Zinc Industry in 1937—Advance Summary. U. S. Bureau of Mines, Washington, D. C.

Measures for Dust Control in Foundries of New York State, by Theodore Hatch, associate dust control engineer. N. Y. State Department of Labor, 80 Centre St., New York City.

Technical Publications

Zinc Alloy Die Casting—an Industrial Achievement, by W. W. Broughton, Engineer, Technical Service, New Jersey Zinc Company, 160 Front St., New York. Reprinted from "Metal Progress," April 1938.

Simultaneous developments of improved casting machines and perfected zinc base alloys are responsible for a great increase in the size, quality, strength and permanence of modern die castings. These new materials have been accepted by many engineers, designers and canny purchasers for an increasing number of applications in the mass production industries.

Associations and Societies

American Foundrymen's Association

222 *W. Adams St., Chicago, Ill.*

The 42nd Annual Convention of the American Foundymen's Association will be held in Cleveland, Ohio, May 16-19. The program includes the following features:

Non-Ferrous Founding

Chairman, *Harold J. Roast*,
Canadian Bronze Co., Montreal, Can.

Heat Treating Zinc Bronze Pressure Castings to Close Up Leakage, by H. Fleck and T. C. Bunch, Pearl Harbor Navy Yard, Honolulu, T. H.

Risers and Gates for Non-Ferrous Castings, by A. E. Cartwright and C. C. Brisbois, Robert Mitchelle Co., Ltd., Montreal, Can.

Fluidity of Red Brass, by Geo. P. Halliwell, H. Kramer Co., Chicago, Ill.

Annual Non-Ferrous Division Business Meeting. Presiding, Division Chairman, H. M. St. John.

Report of Committee on Analysis of Defects.

Report of Committee on Recommended Practice.

Sand Shop Practice Course—Session 1

Chairman, *D. Frank O'Connor*,
Walworth Co., Boston, Mass.

Practical Problems of Non-Ferrous Sand Control. Discussion Leader, A. C. Arbogast, Northern Indiana Brass Co., Elkhart, Ind.

Non-Ferrous Castings

Chairman, *H. M. St. John*,
Detroit Lubricator Co., Detroit, Mich.

Vice-chairman, *Dr. R. W. Dayton*,
Battelle Memorial Institute, Columbus, Ohio

The Role of Silicon in Non-Ferrous Castings, by Dr. H. W. Gillette, Battelle Memorial Institute, Columbus, Ohio.

A Description of the Age Hardening Process as Applied to Castings, by L. W. Kempf, Research Laboratories, Aluminum Co. of America, Cleveland, Ohio.

Production of Castings in Age Hardenable Nickel-Tin Bronzes, by T. E. Kihlgren, International Nickel Co., Bayonne, N. J.

Non-Ferrous Round Table Luncheon Conference

Chairman, *H. J. Rowe*, Aluminum Co. of America, Cleveland, Ohio

Crucible Melting Furnace Developments, by R. J. Stone, Vesuvius Crucible Co., Swissvale, Pa.

Analysis of Causes and Remedies for Certain Types of Defective Casting.

Foundry Cost Methods

Chairman, *Sam Tour,*

Lucius Pitkin, Inc., New York

Non-Ferrous Melting Costs, by A. E. Grover, Berea, Ohio.

Foundry Safety and Hygiene

Chairman, *H. S. Washburn,*

Plainville Casting Co., Plainville, Conn.

Silicosis and the Foundry Industry, by Dr. Leonard Greenberg, Executive Director, Division of Industrial Hygiene, Dept. of Labor, State of New York.

Discussion Leader, Dr. J. H. Chivers, Crane Co., Chicago, Ill.

One of the highlights of Foundrymen's Week will be a stag party arranged for Tuesday evening, May 17th, which will be presented in the Music Hall of the Public Auditorium in the Arena of the Auditorium.

Contracts already signed for space indicate that the huge Cleveland Auditorium will house one of the largest and best shows ever staged by the Association, of machinery equipment and supplies of all kinds for the foundry industry.

Detroit Branch, A.E.S.

Secretary, T. C. Eichstaedt, 679 Virginia Park, Detroit, Mich.

Four hundred persons, including members and others actively interested in the Electro-Plating Industry, gathered at the Hotel Statler, Detroit, Mich., on Friday evening, April 1, 1938, for the Annual Spring Meeting of the Detroit Branch of the American Electro-Platers' Society.

Dr. H. H. Harkins, Development Department, United States Rubber Products, Inc., was the featured speaker of the evening. Dr. Harkins spoke on the subject "*Rubber Linings in the Electro-Plating Field.*" His lecture, which was illustrated with lantern slides, gave a comprehensive description of the part rubber has played in the electroplating industry. An abridged version of Dr. Harkins' talk will be found on p. 225 of this issue.

Newark Branch, A.E.S.

Secretary, George Wagner, 1134 *S. Long Ave., Hillside, N. J.*

The Newark Branch, American Electro-Platers' Society held its 18th annual open educational session and banquet on Saturday, April 23rd, at the Hotel Douglas, Newark. The meeting was attended by a large number of members and guests in the electroplating fraternity. The interested discussions attested to the high quality of the papers read.

T. H. Chamberlain, Technical Director, New Haven Clock Co., New Haven, Conn., Described *An Improved Method of Polishing Small Steel Parts in Barrels.* Mr. Chamberlain gave the details of the construction of the small barrels, polishing pins and polishing mediums.

E. H. Bucy, Technical Director, Zapon Lacquer Co., Stamford, Conn., described *A New Development in Synthetic Resins*—the urea-formaldehyde group, giving the properties of this new type of finish, baking temperatures, chemical resistances, physical properties, etc.

The Nickel Plating of Zinc Base Die Castings and Fabricated Zinc in an Electroplating Barrel, always an interesting topic was described by *Albert Hirsh,* electroplater and chemist, Snyder, Inc., Philadelphia, Pa. Mr. Hirsh has been a specialist in this type of work for some time and has been a prominent contributor to the literature on this subject.

N. E. Promisel, Director of Research Laboratories, International Silver Co., Meriden, Conn., spoke on *What the Microscope Can Tell Electroplaters.* He showed lantern slides and photomicrographs which analyzed electroplating coatings showing their defects, causes, etc.

A. B. Wilson, president of the American Electro-Platers' Society spoke on some of the changes in the constitution which are contemplated for discussion at the coming Convention in Milwaukee.

Austin Fletcher, 3rd vice-president of the Society, announced that 20 branches had already agreed to present exhibits in Milwaukee. He predicted that this year's exhibits would be among the best ever held by the Society.

The banquet was attended by 300 members and guests, who were bountifully fed and entertained. The banquet was followed by dancing.

New Haven Branch

Secretary, Chas. H. Costello, 1285 Boulevard, New Haven, Conn.

An educational session of the New Haven Branch of the American Electro-Platers' was held Tuesday evening, May 3rd at 8 P.M. at the Sterling Chemistry Laboratory of Yale University.

The speaker for the evening was *Dr. Louis Weisberg* of Louis Weisberg, Inc., Engineers-Chemists, who gave an address on "Bright Nickel Plating." He discussed the particular solution which he is familiar with, describing the composition of the solution in detail, stating the purpose of each constituent and outlining its effect on the physical properties of the dpeosit. The effects produced by different types of impurities and methods of removing these impurities were also reviewed.

Porcelain Enamel Institute

612 *North Michigan Ave., Chicago, Ill.*

At the meeting of the Executive Committee of the Porcelain Enamel Institute held in Cleveland, April 12, 1938, it was decided to hold the Eighth Annual Meeting of the Porcelain Enamel Institute in Cleveland, October 25 and 26.

The Third Annual Porcelain Enamel Institute Forum will be held at the University of Illinois in Urbana, Ill., October 12, 13 and 14, 1938. This Forum is an annual affair of the Porcelain Enamel Institute, devoted exclusively to the problems of the shop man in the porcelain enameling industry.

Proceedings of the Second Forum of the Porcelain Enamel Institute held at the Ohio State University, Columbus, Ohio, October 13, 14 and 15, 1937 have been mailed from the Institute offices this week. Copies have been sent to all persons in attendance at the Forum and to all members of the Institute.

Galvanizers Committee

American Zinc Institute, 60 E. 42nd St., New York

Technical and operating men of the galvanized sheet division of the steel industry held a three-day session at the Hotel Statler, St. Louis, Mo., beginning April 25th. Among the technical subjects discussed at these sessions were:

The Meaker Process of Electrogalvanizing, by Ernest H. Lyons, Jr.

Galvanizing Problems from the Metallurgist's Viewpoint, by W. M. Peirce.

The Application of Radiant Tubes to Galvanizing, by Floyd Schlitt.

Western Metal Congress

American Society for Metals, 7016 Euclid Ave., Cleveland, Ohio

Visitors at the Western Metal Exposition, held March 21 to 25 in Los Angeles, totalled 36,391 while approximately 5,000 sat in the technical sessions of the Western Metal Congress.

Showing that industrial men of the eleven western states are shouldering their way out of the depression and are inspired by the motive of the Congress, *W. H. Eisenman,* secretary of the American Society for Metals, said that 1¼ million dollars worth of metals and machinery was sold from the floor of the exhibition.

Attendance mainly was drawn from the eleven western states, although approximately 500 visitors from the East were present, many of them appearing on the Congress programs or in the booths of the exhibit.

Personals

Handy & Harman Elect New Officers

The internationally prominent firm of *Handy & Harman,* 82 Fulton St., New York, dealers in silver and gold, elected new officers to take office May 1st. *Cortlandt W. Handy,* President of the firm since 1927, becomes Chairman. *G. H. Niemeyer,* who has been connected with the firm for 38 years, assumes the office of President. *R. H. Leach,* long the Manager of the Bridgeport Plant and Director of Research, will become Vice-President in

CORTLANDT W. HANDY
Chairman

charge of production and research. *H. W. Boynton* and *H. W. Spaulding* will continue as Treasurer and Secretary, respectively. *J. C. Travis,* in the newly created office of Assistant to the President, will have charge of sales.

The Board of Directors remains unchanged, consisting of Messrs. *Handy, Niemeyer, Leach, Boynton* and *DeLoss.* It is stated there will be no change in company policies.

Cortlandt W. Handy is the third generation of his family to head the firm. He entered the business in 1911 and became President in 1927. He will continue as the senior administrative officer.

G. H. Niemeyer, who becomes President, was born in Chicago in 1883 and began as office boy at the age of 17. At the age of 19 he became the firm's first salesman. In 1915 he became Manager of the New York Plant, later Sales Manager and eventually Vice-President in charge of Sales and Production.

During his long connection with the firm, Mr. Niemeyer has served in an executive

G. H. NIEMEYER
President

R. H. LEACH
Vice-President

capacity in every prominent jewelry trade organization. He has been President of the *Jewelers Board of Trade*, of the *Jewelers 24 Karat Club*, of the *Jewelers Security Alliance*, of the *Brotherhood of Traveling Jewelers* and is now Chairman of the *Jewelers Vigilance Committee*. During the war he was adviser to a section of the War Industry Board and has been prominent in other jewelry trade activities.

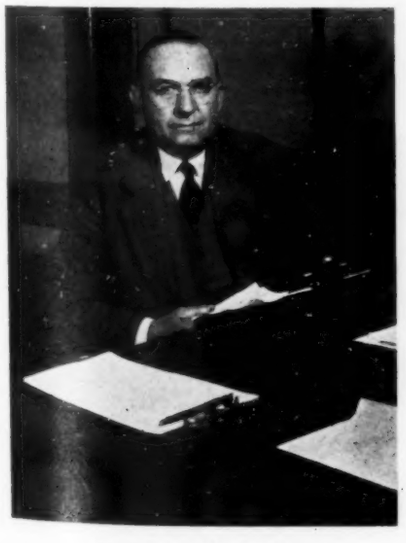
Mr. Niemeyer and Mr. Leach sailed April 22nd, for a business trip to England and the Continent.

The firm of *Handy & Harman* dates from 1867, when the original firm of *Peter Hayden & Co.* was organized to deal in silver and gold bullion, specie and bonds. In pre-Civil War New York, *Peter Hayden* had made the first iron hames for horse collars which he decorated with silver, and his interest in the metal led him into the silver business. In 1869 *Parker Handy*, a banker, took over the Hayden interests, to be succeeded by his son, *Parker D. Handy*, and in turn by the latter's son, *Cortlandt W. Handy*, the present Chairman. The name of *Handy & Harman* dates from 1886 while the business continued otherwise unchanged to the turn of the century.

The business sensed a coming change toward specialized production of materials and in 1901 began the fabrication and refining of precious metals, making sterling silver for silversmiths, silver anodes for plating and other products required by the arts and industries. From the beginning special emphasis has been placed on research work to improve materials and methods of processing.

In 1915 a large modern factory was built in Bridgeport, Conn. This is now the principal plant of the company.

The firm's dealings in bullion have gradually extended to all parts of the world. During the World War, Handy & Harman acted as agents for the United States and British Governments in effecting the export to India of approximately 290,000,000 ounces of silver.



H. W. SPAULDING
Secretary

H. W. BOYNTON
Treasurer

In 1924 a service plant was established in Providence, R. I. Two years ago a plant was built in Toronto, Canada, which is being operated for service to the Canadian trade by *Handy & Harman of Canada, Ltd.*

A Chicago sales office is now being established for service to the trade in the Chicago area.

The company is distributing an illustrated booklet to all industries with which it is connected telling of the changes in officials just made. The booklet includes a short history of the company and many photographs of individuals, with a few words by *Mr. Niemeyer* about their work and background.

J. C. TRAVIS
Asst. to the President

Harold J. Roast, vice president in charge of technical operations, Canadian Bronze Co., Montreal, Can., discussed "Honesty in the Foundry Business" at the March meeting of the Philadelphia chapter of the American Foundrymen's Association, March 11, at the Engineers Club.

George Y. Greiman has been appointed manager of the American Chain & Cable Co. Inc., West York, Pa. Mr. Greiman was formerly an executive of the company's Adrian, Mich., plant for ten years.

Harry W. Ellis has relinquished the post of president and general manager of the Johnson Service Co., Milwaukee, Wisc., manufacturer of temperature control systems, to become chairman of the board. Mr. Ellis is succeeded by *J. A. Cutler*, who was vice-president and sales manager.

F. G. Sefing, research and development division of the International Nickel Co., 67 Wall St., N. Y., gave a talk at the Massachusetts Institute of Technology, April 9th, as part of the American Foundrymen's Association's Regional Foundry Conference. Mr. Sefing discussed the importance of the study of the freezing and structure of the cast metals among which the nickel alloys play a vital part.

J. H. Driscoll has been appointed representative in Boston, Mass., for the *Stearns Magnetic Mfg. Company*, Milwaukee, Wisc., formerly Magnetic Mfg. Co., makers of a line of magnetic separation equipment, magnetic clutches, combination magnetic clutch-brakes and magnetic brakes. Mr. Driscoll's headquarters are at 34 Lewis Wharf, Boston.

Walter S. Gross has joined the sales force of the *H. V. Walker Co.*, Elizabeth, N. J., having formerly been connected with the Egyptian Lacquer Mfg. Co. for a number of years. He will make his headquarters in Philadelphia, covering Eastern Pennsylvania and Southern New Jersey territory.

A. J. Heysel has been appointed manager of the Buffalo branch office of the *E. J. Woodison Co.*, Buffalo, N. Y. He was formerly New York and Pennsylvania representative of the same company.

Wallace D. Walker, of Meadville, was elected president of Talon, Inc., at the annual meeting of the board of directors held here. He succeeds his father, *Colonel Lewis Walker*, founder and first head of the company, whose death in January terminated his nearly twenty-five years as president. Until last October, the corporation has been known as the *Hookless Fastener Company*.

Raymond Szymanowitz, newly appointed Vice-President and Technical Director of Acheson Industries, Inc., Port Huron, Mich., technical development company for the Acheson interests, will speak on the subject of colloidal graphite before the Michigan-Northwestern Ohio Section of the American Ceramic Society, May 6 at Jackson, Michigan.

E. C. Kiekhaefer has been appointed Chief Engineer of the *Stearns Magnetic Mfg. Co.*, formerly Magnetic Mfg. Co., Milwaukee, Wis.

The *Bohn Aluminum and Brass Corporation*, Detroit, Mich., announces the appointment of *Emerson Frantz* as General Sales Manager. Mr. Frantz has been with the Bohn organization since its formation. He came to Detroit in 1915 to join the General Aluminum and Brass Manufacturing Company which was consolidated in 1924 with the Charles Bohn Foundry Company to form the present corporation. Mr. Frantz has been active in both production and sales and when the present corporation was created in 1924 he was placed in charge of sales of the bearing division.

Adolph Frankel has been appointed merchandising manager of the Westinghouse Lamp Division, Westinghouse Electric & Mfg. Co., New York. Mr. Frankel's temporary headquarters will be at 10 High Street, Boston, where he will establish the first regional field office for handling the distribution and marketing of the new Westinghouse Sterilamp. He has been connected with the Westinghouse company since 1917.

W. Z. Friend, of the Development and Research Division of The International Nickel Co., 67 Wall St., New York, addressed the West Virginia Section of the American Society of Mechanical Engineers on April 25th, 1938 at Huntington, West Virginia. Subjects discussed by the speaker included Properties and Applications of Nickel and its Non-Ferrous Alloys, Malleable Nickel, Nickel Copper Alloys, Nickel Silvers, Nickel Brasses and Bronzes, Nickel Chromium Alloys, Complex Nickel Alloys, Nickel Aluminum Alloys. During the dinner session, *H. W. Brown*, Assistant Works Manager of the Huntington Rolling Mill of The International Nickel Company, Inc., gave a talk on, "Rolling Mill Practice and Equipment." The Meeting was held at the Hotel Prichard and was preceded by a dinner which began at 6:30.

E. O. Goss has been re-elected president and chairman of the Board of the *Scovill Manufacturing Co.*, Waterbury, Conn. *Francis T. Reeves*, formerly mayor of Waterbury, secretary of the Scovill company, was added to the Board of Directors. He succeeds the late *H. Lamson Scovill*. *Chauncey P. Goss 3rd* and *P. D. Fenton* were made vice-presidents of the company. All other officers were re-elected.

Herbert S. Hersey, vice-president and general managerial, C. O. Bartlett & Snow Company, Cleveland, has been elected president of the Foundry Equipment Manufacturers' Association.

At the annual meeting of *Revere Copper and Brass Incorporated*, *Rollo E. Falk*, Vice President and General Manufacturing Manager, was elected a Director of the Company. Mr. Falk has been Manufacturing Manager for Revere since 1932, and previously was Works Manager of the Dallas Division, in Chicago, Illinois. Mr. Falk's headquarters are in the New York Central Bldg., New York.

Dr. Howard E. Fritz, who for years headed the Chemical Sales Division of The *B. F. Goodrich Company*, Akron, Ohio, has been placed in charge of the newly-formed Synthetic Sales Department of that company.

Frederick T. Moore

Frederick T. Moore, first vice-president and general works manager of the Colt's Patent Fire Arms Co., died at Hartford, Conn., on March 31st, aged 62 years. Mr. Moore recently underwent an operation. He had become vice-president of the company in January, 1934.

Verified Business Items

City Pattern Works, 1161 Harper St., Detroit, Mich., mechanical patterns, have plans for new plant at Highland Park, consisting of three one-story units for foundry, machine shop and office service, respectively. Cost close to $300,000 with equipment. Departments: brazing, welding, grinding, sandblasting, non-ferrous foundry.

L. Heres De Wyk & Co., Ansonia, Conn., and Boston, Mass., have been appointed representatives for the *D. O. James Mfg. Co.*, Chicago, Ill., for the states of Connecticut, Massachusetts and Rhode Island. The James Co. are manufacturers of all types of speed reducers and cut gears and are celebrating this year their 50th anniversary as gear manufacturers.

Black & Decker Mfg. Company, Towson, Md., announces the opening of their factory service branch at Indianapolis, Ind., located at 935 N. Illinois St.; also one at 630 Baronne St., New Orleans, La.

Boston Gear Works, Inc., North Quincy, Mass., have been appointed general distributor for the United States and Canada, for "Oilite" oil-cushion precision bronze bearings made by the Chrysler Corp. Departments: grinding, sand-blasting, polishing, buffing. Principal base metals used: steel, bronze.

Reliance Electric & Engineering Co., 1068 Ivanhoe Rd., Cleveland, Ohio, announces that *Rutherford Harris* has been added to the staff of the New York office, *C. R. Newpher* to the Cleveland sales office and *George E. Bevis* has been located in Syracuse to represent the company.

United States Plating Co., 4902 St. Clair Ave., Cleveland, Ohio, manufacturer of plated metal products has plans for a new one-story plant at 5213 Perkins Avenue, about 21,000 sq. ft. of floor space but they intend to complete their present lease which runs another year and a half. Departments: pickling, soldering, grinding, descaling, polishing, degreasing, cleaning, plating, tumbling, burnishing, buffing, coloring, lacquering, finishing, tinning. Principal base metals used: brass, steel, bronze, nickel silver, zinc, aluminum and lead.

Frederick Gumm Chemical Co. Inc., 538 Forest St., Kearney, N. J., has been appointed distributor for Lionite polishing grains, manufactured by *General Abrasive Co. Inc.*, Niagara Falls, N. Y., in New York and New Jersey. Complete stocks of all sizes will be carried in their warehouse at Kearney, N. J.

Riverside Metal Company, Riverside, N. J., manufacturers and distributors of nickel silver, phosphor bronze, Cupro nickel, beryllium copper, brass, commercial bronze, Guinea gold alloy and shot copper; sheets, rolls, strips and plates; circles and blanks; wire and rods, bars and the *Seymour Mfg. Company*, Seymour, Conn., manufacturers of nickel silver, phosphor bronze, brass products, Cupro nickel and nickel anodes, have applied for membership in the *Copper & Brass Research Association*, 420 Lexington Ave., New York. These applications will be accepted at the next meeting of the Board of Directors, and in the meantime both companies will be accorded full membership privileges.

Driver-Harris Company of Harrison, N. J., difficulties with the C. I. O. resulting in the closing down of the plant for three weeks, were settled on April 5th. The plant has reopened and resumed operaitons in all departments. The production of alloy castings and alloy wire is again on a normal basis, and immediate deliveries of wire are being made from stock carried at Harrison, Chicago, Cleveland and San Francisco.

The *Detroit Rex Products Company*, Detroit, manufacturers of degreasing machines, solvents, cleaners and strippers, has opened

a branch office at 5905 Pacific Boulevard, Huntingotn Park, California. This office will serve the southwest section of the United States. A warehouse located at Los Angeles will carry ample stocks of solvents.

Utility Fan Corp., 2528 Santa Fe Ave., Los Angeles, Calif., has purchased a 3½ acre site at Soto and Lugo Sts., as part of its expansion program. The sum of $50,000 has been spent for new equipment. Departments: drawing, stamping, soldering, brazing, welding, cleaning, tumbling, lacquering, enameling. Principal base metals used: brass, steel, bronze, aluminum.

Three new foundry equipments designed to improve sand conditioning, and a new unit for mechanical molding, will be introduced at the Foundry Show in Cleveland by The *Beardsley & Piper Company*, Chicago, Illinois.

The *Claude B. Schneible Company*, Chicago, will have a small size working model of the Schneible Multi-Wash Dust Collector in actual operation at the Foundry Show in order that foundrymen can see how it's done by merely climbing up a circular stairway and looking into the tower to watch the dirt being washed from the air without the use of internal moving parts.

The *Whitehead Metal Products Company* opened its new warehouse and assembly plant at 287-303 West Tenth Street, New York, on Monday, April 18th. Now a subsidiary of the International Nickel Company, the Whitehead organization has been located at 304 Hudson Street for the past eleven years where it has maintained main offices as well as facilities for warehousing and distributing metals including nickel, Monel, copper, brass and aluminum in commercial shapes. In recent years, the company has entered the national field as maker and distributor of household equipment including Monel sinks, Monel tops for ranges and tables, Monel tanks for hot water heaters and enameled steel cabinets with Monel tops for kitchens and laundries.

The *Dumore Co.*, Racine, Wisc., celebrates this year its 25th anniversary. It was founded in 1913 by *L. H. Hamilton* and the late *Chester Beach*. The bulk of this company's present business is in the manufacture of fractional horsepower universal motors and portable electric tools for precision grinder. *L. H. Hamilton* is president.

The *Independent Pneumatic Tool Company* of Chicago, Illinois, announces the opening of a new sales-service branch at 6200 E. Slauson Ave., Los Angeles, California. The new office will be in charge of *B. J. Herron*.

Austin-Hastings Co. Inc., 226 Binney St., Cambridge, Mass., distributors of machine tools, metal working and welding equipment, will hold a Machine Tool Show at the Boston Garden Exposition Hall from 9 A.M. to 9 P.M., June 8-11. All types of machine tools, metal working equipment and welding equipment distributed by this company will be shown under power in action. All interested manufacturers are invited to attend.

The Foundry Show, held in the Public Auditorium, Cleveland, from May 14 to 19, will include an instrument exhibit by the *Foxboro Company*, Foxboro, Mass. Featured instrument at the exhibit is the Stabilog Air Weight Controller, controlling air supplied from a Spencer Turbine Company blower. Other instruments on display include the Air-Operated and Electric-Operated Recorder Controllers, Potentiometer Controller, Gages, and Indicating and Recording Thermometers.

Moe Brothers Mfg. Co., 319 E. Claybourn St., Milwaukee, Wisc., will occupy, under lease, a new factory, one-story. The firm manufactures illuminating fixtures. Departments: pickling, spinning, stamping, soldering, brazing, welding, grinding, polishing, degreasing, cleaning, plating, burnishing, buffing, coloring, lacquering, enameling, finishing. Principal base metals used: brass, steel, bronze, aluminum.

L'Hommedieu Company Celebrates 40th Anniversary

Chas. F. L'Hommedieu & Sons Co., 4521 Ogden Ave., Chicago, Ill., are celebrating, this year, their 40th anniversary of continuous service to the electroplating and metal polishing industries. The late president, *Charles F. L'Hommedieu* was one of the oldest living practical platers in the United States. He retained his mental faculties and his interest in his business until the last day of his life.

When he was first learning the trade he used the Snead battery for current. Old-timers will remember that this battery required testing every week and had to be taken apart, cleaned and put together again with every test. The early generators sputtered badly. Better generators followed, however, and the Eddy generator was considered one of the finest of its time. Shortly after the advent of this generator the *L'Hommedieu Company* was established. They were agents for the Eddy generator in Chicago and sold a large number of these machines.

The business was established by *Charles F. L'Hommedieu* in a small office space on Canal and Lake Street. It was later moved to 26 S. Clinton Street and occupied several floors of the building for manufac-

turing their products. Incorporation took place in 1906 with *Charles F. L'Hommedieu*, president, *Charles E. L'Hommedieu* as treasurer and *Arthur W. L'Hommedieu*, secretary, all of whom were directors (as well as *Alice M. L'Hommedieu*). The business has continued as a family corporation. The present site of the home office of the corporation was purchased in 1916. The building has been enlarged since then and warehouses added. A branch is maintained in Cleveland and warehouse stocks in Detroit and Cincinnati.

A. W. L'Hommedieu, now president, has been with the business 38 years, through good times and bad. He finds the late depression and the present day recession more trying than any in the past, due to difference in methods of doing business. In the old days there was more personal contact. Business men knew one another and their words were as good as contracts. He belives, however, that the future will show improvement and he is looking forward to another 40 years of advancement in the manufacture of products required by our present day civilization.

Zinc Mill Built in 46 Days

Construction of the Illinois Zinc Company's new zinc rolling mill located on 47th Street at Sacramento Avenue, Chicago, has been completed in a record term of 46 working days. General offices of the company were established May 1st in the new plant, which was designed and built by The Austin Company. It is of steel, concrete and brick construction and combines plant and office facilities in 65,000 square feet.

Metals for Field and Stream

By M. W. SCHWARZ

Chemical Engineer, New York

The Sportsmen's Show held recently in New York, showed some interesting developments in the use of metals and metal finishes in the sporting goods field.

Rifle bolts and triggers are now being case hardened and chrome plated by *Iver Johnson's Arms & Cycle Works*, Fitchburg, Mass.

Bicycles made by this company showed interesting design and construction trends. In conformance with present day tendencies, they are streamlined and light in weight. In all cases the main frame is made of steel with a baked enamel. In some cases, the steel is chrome plated. The chain adjusting screws are finished in white nickel.

Chromium plate over a heavy nickel is the standard finish for handlebars, mudguards, braces, sprockets, cranks, seat posts, truss forks, hubs, handlebar stems, clamp screws and a variety of screws and nuts.

A development of the *Evinrude Division* of the *Outboard Marine & Manufacturing Company*, Milwaukee, Wisc., is a bicycle with the main frame made of sand cast aluminum alloy, a single casting finished with a smooth baked enamel. This construction replaces steel tubing which is the conventional construction in most bicycles.

The first really new fish-hook shown the

public in over thirty years was demonstrated most effectively by the inventor, *Whiting Evans*, of the *Evans Hook Company*, 102 Fenimore St., Brooklyn, N. Y. The hook is shaped like a question mark and the barb section is similar in design to a harpoon. It is made in England mostly by hand labor and must go through an "upsetting" and milling process in order to form the barb. The material used is high carbon steel, heat treated. The finished product is cadmium plated.

New Aluminum Research

The Aluminum Cylinder Head Committee has been organized by the six leading aluminum cylinder head manufacturers on a cooperative basis. These manufacturers include: *Advance Aluminum Castings Corp.*, 2742 W. 36th St., Chicago, Ill.; *Aluminum Co. of America*, Pittsburgh, Pa.; *Aluminum Industries, Inc.*, 2438 Beekman St., Cincinnati, Ohio; *Bohn Aluminum & Brass Corp.*, Michigan Ave. and Shelby St., Detroit, Mich.; *National Bronze & Aluminum Foundry Co.*, E. 88th St. and Laisy Ave., Cleveland, Ohio; *Permold Works*, 6700 Grant Ave., Cleveland, Ohio.

A report from this committee states that the research has already established the fact that higher compressions made possible by aluminum cylinder heads and improved combustion chambers can reduce the cost per horsepower of automobile engines, while improving performance throughout the range of driving speeds.

Metal Market Review

April 21, 1938.

Copper registered no change in the domestic price of 10c per pound, electrolytic, delivered Connecticut Valley, during the past five-week period. The only evidence of activity appeared in the export market which swayed somewhat uncertainly, although between not very wide limits. The factors which affected that market were not industrial but rather political and speculative, and on the whole the European markets were active with increasing strength. The CIF price at one time climbed from 10 to 20 points above the American price but has since subsided to 9.90.

Sales week by week were 4,687; 5,487; 6,313; 5,528 and 6,433 tons, making a total of 28,448 tons, compared with 24,744 tons for the previous four weeks. Sales in March amounted to 22,012 tons against 23,518 tons in February. Statistics for March showed that domestic stocks of refined metal on hand totalled 342,785 tons, an increase of 16,541 tons over the previous month. Blister stocks were reduced by 5,197 tons making a net increase of 11,344 tons. Stocks of refined metal abroad totalled 197,467 against 203,609 tons, a decrease of 6,242 tons. At this time the market is on the firm side.

Zinc continued to suffer from the weakness of the previous month, slipping to 4.15c per pound, Prime Western, E. St. Louis, and then to 4c. During the previous week, however, inquiry for the common grades of zinc was sufficient to bring about a strengthening, and price is now back to 4.25. Demand has fallen off somewhat, however, and that fact together with difficulties in reviving the old European zinc cartel make the outlook uncertain. Stocks of zinc in the United States at the end of March totalled 118,009 tons an increase of 9,871 tons over the previous month.

Tin suffered a bad spell. After fluttering nervously between 41 and 41.5c per pound Straits, for a few days since our last report here, the metal slumped sharply to 39c because of poor consumption in this country and difficulties with production quotas abroad. The slide continued to 37.85 from which low point it reacted to 40 and then receded again to the present figure of 38.625.

There are so many varied and conflicting influences in the tin market that the present trend is indiscernible.

Lead was unchanged with price remaining at 4.35c per pound E. St. Louis. Beginning with business rather dull, activity improved perceptibly during the past five

weeks with a steadying effect on the market. Sales week by week were 1,627, 1,000, 2,417, 3,728 and 3,936 tons making a total of 12,708 tons, compared with 17,036 tons in the previous four weeks. With consumption of lead estimated at about 30,000 tons a month, it is felt that the market will remain steady. March statistics showed an increase in stocks of 5,377 tons, to 143,511 tons.

Silver was quiet and steady at 44¾c per pound until the announcement that on April 1st the United States Treasury would cease buying Mexican silver, which was followed by a reduction in its open market price from 45 to 44 and then to 43c per ounce Troy. The New York official price, of course, followed immediately to 42¾ where it now rests. Late reports show that the Treasury is purchasing Mexican silver in the open market. Present situation quiet and steady.

Scrap Metals followed the European markets closely. Copper scrap swung back and forth with the CIF price of virgin metal. Aluminum scrap was cut sharply during the week of March 21st and has remained dull since then. The brass and aluminum ingot business has been very slow although during the present week a better call for brass ingot has been in evidence.

On April 1st unfilled orders on the books of the members of the Non-Ferrous Ingot Metal Institute amounted to 10,488 net tons against 11,935 tons on March 1st.

The combined deliveries of brass and bronze ingots and billets for members in the month of March amounted to 3,305 tons compared with 2,756 tons in February.

The Institute reports the average prices per pound received by its members on commercial grades of ingot brass and bronze during the 28-day period ending March 18th as follows:

	4 wks. end. Mar. 18	4 wks. end. Feb. 18
80-10-10	11.806	11.933
78% Metal	9.333	9.307
81% Metal	9.528	9,807
83% Metal	9.784	9.777
85% Metal	10.074	10.204
No. 1 Yellow	8.408	8.623

Average Prices for Metals

	Mar.
Copper c/lb. Duty 4c/lb.	
Lake (del. Conn. Producers' Prices)	10.062
Electrolytic (del. Conn. Producers' Prices)	10.000
Casting (f.o.b. ref.)	9.525
Zinc (f.o.b. E. St. Louis) c/lb. Duty 1¾ c/lb.	
Prime Western (for Brass Special add 0.05-0.10)	4.413
Tin (f.o.b. N. Y.) c/lb. Duty Free, Straits	41.152
Lead (f.o.b. St. L.) c/lb. Duty 2½ c/lb.	4.35
Aluminum c/lb. Duty 4 c/lb.	20.000
Nickel c/lb. Duty 3 c/lb. Electrolytic 99.9%	35.000
Antimony (Ch.) c/lb. Duty 2 c/lb.	15.75
Silver c/oz. Troy, Duty Free	44.446
Platinum $/oz. Troy, Duty Free	35.739
Gold—Official U. S. Treasury Price	35.000

Supply Prices, April 27, 1938

Anodes

Prices, except silver, are per lb. f.o.b., shipping point, based on purchases of 2,000 lbs. or more, and subject to changes due to fluctuating metal markets.

COPPER: Cast ..... 19⅝c. per lb.
Electrolytic, full size, 14⅝c. cut to size .. 14⅝c. per lb.
Rolled oval, straight, 15⅛c.; curved .... 16⅛c. per lb.
BRASS: Cast ..... 18⅜c. per lb.
ZINC: Cast ..... 11¼c. per lb.

NICKEL: 90-92%, 16″ and over ..... .45 per lb.
95-97%, 16″ " " ..... .46 per lb.
99%+cast, 16″ and over, 47c.; rolled, depolarized, 16″ and over, 48.
SILVER: Rolled silver anodes .999 fine were quoted April 27, from 46c. per Troy ounce upward, depending on quantity.

White Spanish Felt Polishing Wheels

Diameter	Thickness Under ½″	½-15/16″	1-2″	2-3½″	Over 3½″
Under 1″	6.35-6.40	6.20-6.25	6.10-6.15	6.10-6.15	6.35-6.40
1″ to 1 7/16″	5.85	5.70	5.60	5.60	5.85
1½″ to 3 15/16″	5.55	5.35-5.40	5.30-5.35	5.30-5.35	5.60
4-5 15/16″	4.95-5.00	4.70-4.85	4.65-4.75	4.65-4.75	4.95-5.00
6″, 8″ & 9″	3.80-4.25	3.45-3.95	2.45-3.05	2.45-3.00	2.90-3.35
10″ to 18″	3.80-4.25	3.45-3.95	2.45-2.95	2.45-2.85	2.90-3.25
Over 18″	3.80-4.25	3.45-3.95	2.70-3.05	2.70-3.00	2.90-3.35

Prices above are for less than 50 lb. For over 50 lbs. various discounts or deductions are allowed.

On grey Mexican wheels deduct 10c per lb. from above prices.

Cotton Buffs

Full disc open buffs, per 100 sections when purchased in lots of 100 or less are quoted:

16″ 20 ply 84/92 Unbleached	$75.24
14″ 20 ply 84/92 Unbleached	57.67
12″ 20 ply 84/92 Unbleached	43.28
16″ 20 ply 80/92 Unbleached	63.28
14″ 20 ply 80/92 Unbleached	48.57
12″ 20 ply 80/92 Unbleached	36.52
16″ 20 ply 64/68 Unbleached	59.69
14″ 20 ply 64/68 Unbleached	45.84
12″ 20 ply 64/68 Unbleached	34.49

⅜″ Sewed Buffs, per lb., bleached or unbleached 54c to 90c

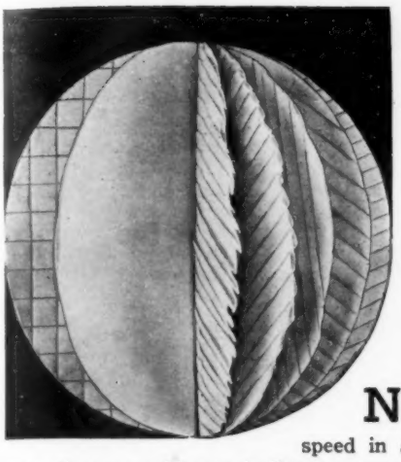
Chemicals

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone C. P. l.c.l. Drums	lb.	.06¼
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.05¼-.05¾
Chromic, 100 lb. and 400 lb. drums		.16¾-.17¼
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.027
Hydrochloric, C. P., 20 deg., carboys	lb.	.08
Hydrofluoric, 30%, bbls.	lb.	.07-.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07½
Sulphuric, 66 deg., carboys	lb.	.02½
Alcohol—Butyl, drums (f.o.b. destination)	lb.	.10-.10½
Denatured, carloads, indust., (f.o.b. prod. pts.)	gal.	.33-.38
Alum—Lump, barrels	lb.	.0340-.0365
Powdered, barrels	lb.	.0355-.0380
Ammonia, aqua, com'l., 26 deg., drums, carboys	lb.	.02½-.05¼
Ammonium—Sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide, technical crystals, kegs	lb.	.55-.58
Arsenic, white kegs	lb.	.04½-.05
Asphaltum, powder, kegs	lb.	.23-.41
Benzol, pure, drums	gal.	.41
Borax, granular, 99½+%, ton lots	lb.	.0255-.0305
Cadmium oxide, 50 to 1,000 lbs.	lb.	1.20
Calcium Carbonate (Precipitated Chalk), U. S. P.	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05¾-.06
Chrome, Green, commercial, bbls.	lb.	.21½
Chromic Sulphate, drums	lb.	.26¼
*Copper—Acetate (Verdigris)	lb.	.25
Carbonate, 53/55% cu., bbls.	lb.	.14½-.15½
Cyanide (100 lb. kgs.)	lb.	.34
Sulphate, tech., crystals, bbls.	lb.	.0495
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus Martis (Iron Oxide) red, tech., kegs	lb.	.07
Dextrin, yellow, kegs	lb.	.05-.08
Emery Flour (Turkish)	lb.	.07
Flint, powdered	ton	30.00
Fluorspar, bags	lb.	.03½
*Gold Chloride	oz.	$18¼-23
*Gold Cyanide, Potassium 41%		$15.45
*Gold Cyanide, Sodium 46%		$17.10
Gum—Sandarac, prime, bags	lb.	.50
Shellac, various grades and quantities	lb.	.21-.31
Iron Sulphate (Copperas), bbls.	lb.	.016
Lead—Acetate (Sugar of Lead), bbls.	lb.	.11-.13¾
Oxide (Litharge), bbls.	lb.	.12½
Lime Compositions for Nickel	lb.	.09½-.11
Lime Compositions for Brass	lb.	.09½-.11
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, (Wood Alcohol) Pure, drums l.c.l.	gal.	.40½
Nickel—Carbonate, dry bbls.	lb.	.36-.41
Chloride, bbls.	lb.	.18-.22
Salts, single, 425 lb. bbls.	lb.	.13½-.14½
Salts, double, 425 lb. bbls.	lb.	.13½-.14½
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.07¼-.08⅝
Potassium—Bichromate, casks (crystals)	lb.	.09¼
Carbonate, 98-100%	lb.	.06¾
Cyanide, 165 lbs. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.03
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.07½
*Silver—Chloride, dry, 100 oz. lots	oz.	.38¾
Cyanide, 100 oz. lots	oz.	.43¼
Nitrate, 100 ounce lots	oz.	.33¼
Soda Ash, 58%, bbls.	lb.	.0235
Sodium—Cyanide, 96 to 98%, 100 lb. drums	lb.	.15
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate, granular, bbls.	lb.	3.15
Nitrate, tech., bbls.	lb.	.029
Phosphate, tribasic, tech., bbls.	lb.	.03
Silicate (Water Glass), bbls.	lb.	.01½
*Stannate, drums	lb.	.26½-.29½
Sulphocyanide, drums	lb.	.30-.35
Sulphur (Brimstone), bbls.	lb.	.02¾
*Tin Chloride, 100 lb. kegs	lb.	.32½
Tripoli, powdered	lb.	.03
Trisodium Phosphate—see Sodium Phosphate.		
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
White Silica Compositions for Brass	lb.	.07½-.10
Whiting, Bolted	lb.	.02½-.06
Zinc—Carbonate, bbls.	lb.	.13
Cyanide (100 lb. kegs)	lb.	.33
Chloride, drums, bbls.	lb.	.065
Sulphate, bbls.	lb.	.04

* **Subject to fluctuations in metal prices.**

Metal Prices on page 268.

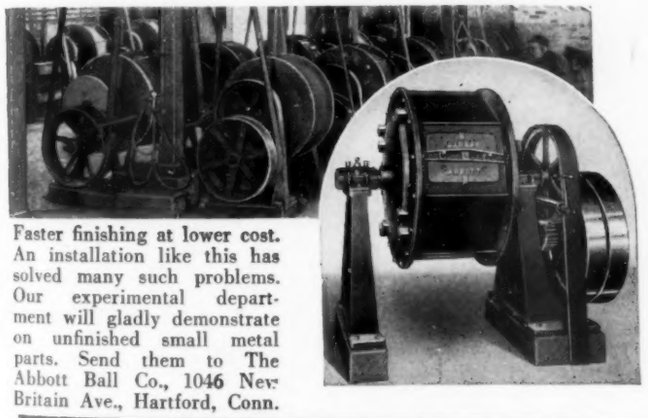


Make A Shop Test Of Yerges Buffs

NO OTHER buff gives such economy and speed in all cutting and buffing operations as a Yerges buff because no other buff is designed and made in the same way. The square-stitched, pleated sections of special muslin are bias-cut and each piece is laid at a specified angle to the next piece. Pockets automatically form at the edge as the buff wears, holding and saving abrasive.

Yerges buffs are available for a wide variety of work, from the softest buffing to the hardest cutting. Let us send you samples and data. The Yerges Mfg. Company, Fremont, Ohio.

YERGES



Faster finishing at lower cost. An installation like this has solved many such problems. Our experimental department will gladly demonstrate on unfinished small metal parts. Send them to The Abbott Ball Co., 1046 New Britain Ave., Hartford, Conn.

ABBOTT BALL BURNISHING

The primary purpose of advertising is inquiry solicitation. When interested in equipment and supplies featured in this publication, please mention Metal Industry.

Besplate

NICKEL ANODES

ARE QUALITY PRODUCTS . . .

LEADERS in the Nickel Plating Industry have standardized on McGean Besplate 99% Nickel Anodes — Because

1. Cathode Deposits are smoother
2. Anode corrosion is excellent
3. Less frequent filtering of solution required

◆◆◆◆◆

We Also Offer

Genuine Rolled Oval Depolarized Nickel Anodes

◆◆◆◆◆

From our complete line of Anodes and Plating Chemicals we call your attention to the following:

ANODES

Nickel (all percentages)	Tin
Copper	Brass
Cadmium	Zinc

CHEMICALS

Nickel Salts	Copper Sulphate
Nickel Chloride	Copper Cyanide
Nickel Carbonate	Copper Carbonate
Chromic Acid	Cadmium Oxide

Manufactured by

THE McGEAN CHEMICAL COMPANY
CLEVELAND, OHIO

McGEAN CHEMICALS

Metal Prices, April 27, 1938

(Import duties and taxes under U. S. Tariff Act of 1930, and Revenue Act of 1932)

New Metals

COPPER: Lake, 10.125, Electrolytic, 10.00, Casting, 9.525.
ZINC: Prime Western, 4.25. Brass Special, 4.35.
TIN: Straits, 37.50. LEAD: 4.35.
ALUMINUM: 20. ANTIMONY, Ch. 15.25.
NICKEL: Shot, 36. Elec., 35.
QUICKSILVER: Flasks, 75 lbs., $71-72. BISMUTH, $1.00.
CADMIUM, .85-.$1.20. SILVER, Troy oz., official pr. N. Y., Apr. 26, 42¾c.
GOLD: Oz. Troy, Official U. S. Treasury price $35.00.
SCRAP GOLD, 6¾c. per pennyweight per karat, dealers' quotation.
PLATINUM, oz. Troy $35.

Duties: Copper, 4c. lb.; zinc, 1¾c. lb.; tin, free; lead, 2½c. lb.; aluminum, 4c. lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

Ingot Metals and Alloys

	Cents lb.	Duty	U. S. Import Tax*
No. 1 Yellow Brass	8.50	None	4c. lb.[1]
85-5-5-5	10.25	None	4c. lb.[1]
88-10-2	13.75	None	4c. lb.[1]
80-10-10	12	None	4c. lb.[1]
Manganese Bronze (60,000 t. s. min.)	10.50	None	4c. lb.[1]
Aluminum Bronze	14.75	None	4c. lb.[1]
Monel Metal Shot or Block	28	25% a. v.	None
Nickel Silver (12% Ni)	12.50	20% a. v.	4c. lb.[1]
Nickel Silver (15% Ni)	14.75	20% a. v.	4c. lb.[1]
No. 12 Aluminum	16.25-19	4c. lb.	None
Manganese Copper, Grade A (30%)	23-28	25% a. v.	3c. lb.[1]
Phosphor Copper, 10%	15.00	3c. lb.	4c. lb.[1]
Phosphor Copper, 15%	16.00	3c. lb.	4c. lb.[1]
Silicon Copper, 10%	21.50	45% a. v.	4c. lb.[1]
Phosphor Tin, no guarantee	50-60	None	None
Iridium Platinum, 5% (Nominal)	$36-38	None	None
Iridium Platinum, 10% (Nominal)	$38-40	None	None

*** Duty is under U. S. Tariff Act of 1930; tax under Section 60 (7) of Revenue Act of 1932.**
[1] On copper content. [2] On total weight. "a. v." means ad valorem.

Old Metals

Dealers' buying prices, wholesale quantities:	Cents. lb.	Duty	U. S. Import Tax
Heavy copper and wire, mixed	6½ to 6¾	Free	4c. per pound on copper content
Light copper	5½ to 5¾	Free	
Heavy yellow brass	4 to 4¼	Free	
Light brass	3½ to 3¾	Free	
No. 1 composition	5⅞ to 6⅛	Free	
Composition turnings	5½ to 5⅝	Free	
Heavy soft lead	3¼ to 3¾	2⅛c. lb.	None
Old zinc	2¼ to 2⅜	1½c. lb.	
New zinc clips	3⅛ to 3¼	1½c. lb.	
Aluminum clips (new, soft)	12½ to 13	4c. lb.	
Scrap aluminum, cast	6 to 6¼	4c. lb.	
Aluminum borings—turnings	4½ to 4¾	4c. lb.	
No. 1 pewter	23 to 24	Free	
Electrotype	4 to 4¼	2⅛c. lb.*	
Nickel anodes	29 to 30	10%	
Nickel clips, new	30 to 31	10%	
Monel scrap	7½ to 13½	10% av.	

*** On lead content.**

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, quantity, packing, etc., or discounts, as shown in manufacturers' lists, effective since March 14, 1938. Basic quantities on most rolled or drawn brass and bronze items below are from 2,000 to 5,000 pounds; on nickel silver, from 1,000 to 2,000 pounds.

Copper Material

	Net base per lb.	Duty*
Sheet, hot rolled	18⅛c.	2½c. lb.
Bare wire, soft, less than carloads	14⅛c.	25% a. v.
Seamless tubing	18⅝c.	7c. lb.

*** Each of the above subject to import tax of 4c. lb. in addition to duty under Revenue Act of 1932.**

Nickel Silver

Net base prices per lb. (Duty 30% ad valorem.)

Sheet Metal		Wire and Rod	
10% Quality	26⅜c.	10% Quality	29 c.
15% Quality	28½c.	15% Quality	33⅜c.
18% Quality	29¾c.	18% Quality	36⅝c.

Brass and Bronze Material

	Yellow Brass	Red Brass 80%	Comm'l. Bronze	Duty	
Sheet	16⅜c.	17¼c.	18⅛	4c. lb.	U. S. Import Tax 4c. lb. on copper content.
Wire	16⅝c.	17½c.	18¼	20%	
Rod	12⅜c.	17½c.	18¼	4c. lb.	
Angles, channels	24⅞c.	25¾c.	26⅝	12c. lb.	
Seamless tubing	19⅛c.	19¾c.	20½	8c. lb.	
Open seam tubing	24⅞c.	25¾c.	26⅝	20% a. v.	

Tobin Bronze and Muntz Metal

(Duty 4c. lb.; import tax 4c. lb. on copper content.)

Net base prices per pound.	
Tobin Bronze Rod	18¼c.
Muntz or Yellow Rectangular and other sheathing	19⅝c.
Muntz or Yellow Metal Rod	15¾c.

Aluminum Sheet and Coil

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, carload lots, per lb.	33.00c.
Aluminum coils, 24 ga., base price, carload lots, per lb.	28.50c

Rolled Nickel Sheet and Rod

Net Base Prices

Cold Drawn Rods	50c.	Standard Cold Rolled Sheet	49c.
Hot Rolled Rods	45c.		

Monel Metal Sheet and Rod

Hot Rolled Rods (base)	35c.	No. 35 Sheets (base)	37c.
Cold Drawn Rods (base)	40c.	Std. Cold Rolled Sheets (base)	39c.

Silver Sheet

Rolled sterling silver (March 24) 45c. per Troy oz. upward according to quantity. (Duty, 65% ad valorem.)

Zinc and Lead Sheet

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots standard sizes and gauges, at mill, less 7 per cent discount	9.75	2c. lb.
Zinc sheet, 1200 lb. lots (jobbers' prices)	10.75	2c. lb.
Zinc sheet, 100 lb. lots (jobbers' prices)	14.75	2c. lb.
Full Lead Sheet (base price)	7.50	2⅜c. lb.
Cut Lead Sheet (base price)	7.75	2⅜c. lb.

Block Tin, Pewter and Britannia Sheet

(Duty Free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs. over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price

Supply Prices on page 266.

METAL INDUSTRY
FABRICATION · ASSEMBLING · PLATING · FINISHING

American Electroplating Society 26th Annual Convention

THE American Electro-Platers' Society—like time—marches on. In good times, in bad times, in sunshine, in storm, the Society has continued to grow year by year, in numerical strength, financial strength, in intellectual strength. Guided by its slogan, "Knowledge is Power" it has climbed steadily to heights which, in its early days, would have seemed far above the peak of possibility. But we know that every step upward only discloses new summits to achieve.

The Milwaukee convention presents an educational program as distinctive in character as any which has ever been given. It is a "platers' program." It is the result of group effort. It has been built by the cooperation of the Society, Branch by Branch, each one taking a share of the load and contributing its quota to the total.

The exhibit of plated work represents to just as great an extent, the cooperation of the Branches. Almost every Branch in the Society will present a display in the competition for the **Metal Industry** Cup. The growth in number and quality of these exhibits during the past few years promises well for this year's exhibit which, it is already known, will surpass all others in size.

Members of the Society who are regular attendants at conventions need no persuasion or arguments to show them how valuable the conventions are. To the others, however, we address our urging. To the plater, the chemist and the metallurgist we say, "Come if you possibly can." To the employers of these key technical men we say, "Send them and pay their way. Their reports will be worth many times their expenses." To metal products manufacturing executives as a whole we say, "Never forget that 'It is the finish that makes the sale.' "

At no other gathering can one learn a fraction of the amount about Finishes to be gained at the conventions of the American Electro-Platers' Society.

The following pages tell the story of what to see and hear. Read it and go to the convention.

Founded January, 1903 by
PALMER H. LANGDON
1868-1935

METAL INDUSTRY

VOLUME 36 JUNE, 1938 NUMBER 6

Publication Office:
116 John Street, New York

CONTENTS

DEPARTMENTS

***METAL INDUSTRY** articles are listed regularly in the Engineering Index and the Industrial Arts Index.*